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Mind the gap in SEA: An institutional perspective on why the assessment of synergies in climate change mitigation, adaptation and other policy areas are missing

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Abstract

This article takes its point of departure in two approaches to integrating climate change into Strategic Environmental Assessment (SEA): Mitigation and adaptation, and in the fact that these, as well as the synergies between them and other policy areas, are needed as part of an integrated assessment and policy response. First, the article makes a review of how positive and negative synergies between a) climate change mitigation and adaptation and b) climate change and other environmental concerns are integrated into Danish SEA practice. Then, the article discusses the implications of not addressing synergies. Finally, the article explores institutional explanations as to why synergies are not addressed in SEA practice. A document analysis of 149 Danish SEA reports shows that only one report comprises the assessment of synergies between mitigation and adaptation, while 9,4 % of the reports assess the synergies between climate change and other environmental concerns. The consequences of separation are both the risk of trade-offs and missed opportunities for enhancing positive synergies. In order to propose explanations for the lacking integration, the institutional background is analysed and discussed, mainly based on Scott's theory of institutions. The institutional analysis highlights a regulatory element, since the assessment of climate change synergies is underpinned by legislation, but not by guidance. This means that great focus is on normative elements such as the local interpretation of legislation and of climate change mitigation and adaptation. The analysis also focuses on how the fragmentation of the organisation in which climate change and SEA are embedded has bearings on both normative and cultural-cognitive elements. This makes the assessment of synergies challenging. The evidence gathered and presented in the article points to a need for developing the SEA process and methodology in Denmark with the aim to include climate change in the assessments in a more systematic and integrated manner.

Key words: Strategic environmental assessment; climate change; integrated assessment; synergy; institutional theory

1 Introduction

Climate change is viewed as one of the major environmental challenges of the global society. The Intergovernmental Panel on Climate Change (IPCC) stress in their 4th assessment that "*warming of the climate system is unequivocal*" and that it is very likely that the warming is caused by anthropogenic greenhouse gas emissions (Bernstein et al. 2007, 1, 5). The warming is predicted to have various impacts, e.g., on water availability, ecosystems and flooding (IPCC 2007). The fact that policy responses to climate change require both mitigation and adaptation is underlined by several researchers and institutions, hereunder the IPCC, which states that, "*There is high confidence that neither adaptation nor mitigation alone can avoid all climate change impacts. Adaptation is necessary both in the short term and longer term to address impacts resulting from the warming that would occur even for the lowest stabilisation scenarios assessed. There are barriers, limits and costs that are not fully understood. Adaptation and mitigation can complement each other and together can significantly reduce the risks of climate change*" (Bernstein et al. 2007, 65). IPCC further acknowledges the need to view and assess climate change measures in a broader sustainability context. IPCC was created in 1988 with the role "*to assess on a*

comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation." (IPCC 1998). Since then, the treatment of linkages between climate change and sustainable development has increased in IPCC's assessments reports (Najam et al. 2003) and the urgency of engaging with climate change in a more comprehensive way is clearly stated in the conclusion of the fourth assessment report: "*approaches that exploit synergies between environmental policies and key national socio-economic objectives like growth and equity could help mitigate and reduce vulnerability to climate change, as well as promote sustainable development*" (Watson 2001, 132). Based upon the scoping document for the upcoming fifth assessment, IPCC continues underlining the need for exploring interactions between adaptation, mitigation and development (IPCC 2010).

Several researchers within the field of planning and impact assessment also underline this exploration of synergies between climate change and other environmental policies. The expediency of the holistic approach is, e.g., emphasised by the work of Hamin and Gurran (2009), who point out that mitigation and adaptation may have different and conflicting goals and solutions in spatial planning. Wilson (2010) also points to the expediency of "*an integrated assessment of interactions of climate change mitigation and adaptation policies and measures*". This is based on the need for a systematic approach to uncovering both positive and negative synergies.

Thus, an integrated approach to climate change in terms of viewing mitigation, adaptation, other environmental concerns and the synergies between these is suggested. However, the following will highlight an existing gap between this recommendation and current assessment practice, and the article will discuss the reasons for this gap.

1.1 Climate change, SEA regulation and guidance

SEA, which in the European context is governed by the EU Directive "*on the assessment of the effects of certain plans and programmes on the environment*" from 2001, has been pointed out as a relevant area of focus when dealing with climate change. The directive points out "*climatic factors*" as one factor of which likely significant impacts need to be assessed (European Parliament and Council of the European Union 2001, Annex 1). Furthermore, the Directive places demands on assessments to take into account the interrelationships between the different environmental issues included in the assessment, as well as synergistic and cumulative impacts (European Parliament and Council of the European Union 2001). Thus, the Directive expresses an expectation of a holistic assessment across issues and impacts. Presently, the EU is developing guidance on the integration of climate change into EIA and SEA, in which the linkages between climate change and biodiversity are explored.

The EU requirements have been transferred directly into the Danish legislation (LBK nr 1398 2007). There is no specific guidance on the integration of climate change into SEA in Denmark. However, in the strategy for climate change adaptation published by the Danish Government, impact assessment is also mentioned, since the strategy asks for "*an assessment of whether the existing arrangements for impact assessment, for instance SEA (Strategic Environmental Assessment) and EIA (Environmental Impact Assessment) are sufficient from a climate change adaptation point of view or if changes are required*" (Danish Government 2008, 30).

Internationally, different authors have worked with methods for integrating climate change into the impact assessment of projects (see for example Byer and Yeomans 2007; Duinker and Greig 2007; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment

2003). Authors have also dealt with the issues of integrating climate change into SEA. Notably Levett-Therivel Sustainability Consultants (2007) have published the UK guidance on integrating climate change into SEA, while Larsen and Kørnøv (2009) suggest a conceptual approach to integrating climate change into SEA. Also the OECD has published guidance specifically on how to integrate climate change into SEA (Risse and Brooks 2008). However, this literature on climate change integration into SEA appears to be based on a conceptual approach of how it should be done rather than empirical studies of the current practice, especially in terms of addressing the positive and negative synergies. This is where this article seeks to contribute with an analysis of the current practice of integrating climate change into SEA in Denmark. The first focus in this analysis is on the actual scope of climate change in SEA, and for this purpose, an analytical framework based on Larsen and Kørnøv (2009) is used. Secondly, the focus is on how synergies are addressed in SEA practice.

1.2 Scope of integrating climate change into SEA

Larsen and Kørnøv (2009) present three overall approaches to integrating climate change in SEA: Mitigation, adaptation, and baseline adaptation. However, for the purpose of this article, the scope is limited to mitigation and adaptation, as illustrated in Figure 1.

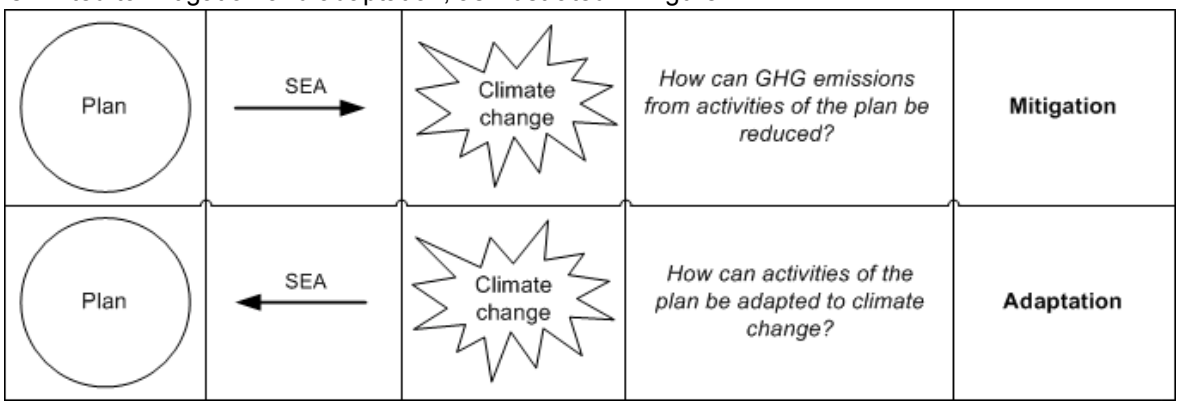

Figure 1 Approaches to integrating climate change into SEA (Based on Larsen and Kørnøv 2009)

Mitigation is a known concept related to climate change defined as "*an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gasses*" (McCarthy et al. 2001, 982). In SEA, mitigation refers to assessing the environmental effects of a plan in terms of potential emissions of greenhouse gasses (GHG) resulting from the plan and the abatement of these (Larsen and Kørnøv 2009). For example, an SEA of a development plan for a new urban area can include assessments of GHG emissions from generated traffic.

Adaptation is also a well-known concept, which can be defined as the "*adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities*" (McCarthy et al. 2001, 990). In relation to SEA, adaptation deals with climate change as an environmental problem of relevance to the plan and if and how it is expedient to adapt the plan to future climate change (Larsen and Kørnøv 2009). For example, the SEA of an overall spatial plan can include assessments of appropriate building sites in the light of future sea level rise.

It is the synergies between these two approaches as well as with other environmental issues that are explored in the following.

1.3 Types of synergies

Synergy comes from the Greek word 'synergos', meaning working together (Merriam-Webster), and refers to both positive and negative outcomes. The positive synergies imply win-win outcomes with protection/enhancement of different environmental aspects; while the negative synergies are interactions of impacts in ways which lead to the loss of one environmental quality in return for the gain of another. The latter is often referred to as trade-offs.

As stated, important aspects of the integration of mitigation and adaptation into SEA are the possible synergies between the two approaches. At the same time, climate change (mitigation and adaptation) has synergies with other environmental concerns and policy areas, which need to be addressed simultaneously. Figure 2 shows examples of synergies.

Categories	Definitions	Examples
Negative climate synergies	*Losing mitigation benefits in return for gaining adaptation and vice versa*	**Mitigation - mitigation** Densification in urban areas to reduce car dependency and to increase bicycling, walking and public transport can create an increase in city temperature and thereby increase the heat island effect. The consequence can be increased use of electricity for ventilation – but also increased car transport out of the city in the summer. **Mitigation - adaptation** Densification can happen at the expense of rainwater drainage, and thereby increase the flooding risk.
Positive climate synergies	*Adaptation and/or mitigation measures interact and enhance positive effects on climate change goals*	**Adaptation - mitigation** Trees and other vegetation in urban areas create a carbon sink, and, due to shading and increased precipitation, reduce the temperature, whereby the necessity for ventilation is reduced.
Negative environmental synergies	*Losing environmental benefits in return for climate change mitigation and/or adaptation*	Infrastructure for and use of electric vehicles might create the risk of an increase in cars and thereby in congestion in cities.
Positive environmental synergies	*Adaptation and/or mitigation measures interact with the context and enhance other environmental aspects*	Trees and other vegetation in urban areas provide climate change adaptation and, at the same, time also air cleaning and increased opportunity for recreation.

Figure 2 Categories, definitions and examples of synergies.

Exploring and uncovering synergies can help provide a more integrated assessment, leading to more climate-proof planning and decision-making.

1.4 Research questions

Part of the purpose of SEA is to provide an integrated and holistic assessment of the potential consequences of policies, plans and programmes. This calls for a consideration of all approaches to climate change in SEA and the synergies with other environmental concerns. On the basis of this, the following research questions are put forward:

- **How are mitigation and adaptation to climate change integrated into Danish SEA practice?**

- **How are positive and negative synergies integrated into Danish SEA practice?**
- **What are the possible institutional explanations for the status of the integration of climate change and synergies into Danish SEA practice?**

The methodology for data collection is presented in the following section.

2 Data collection

In order to answer the questions stated above, two data sources are utilised: A document study to determine how broad the scope in integrating climate change is in Danish SEAs; and interviews to support the institutional analysis.

2.1 Document study

149 Danish SEA reports were gathered and analysed in terms of their integration of climate change. The reports were chosen on the basis of the following parameters:

- Type of plan: covering both sectoral, local and comprehensive plans
- Region of origin: covering all the regions in Denmark
- Year of publication: covering the time from the implementation of SEA in Denmark to the end of 2009

This has led to the identification of 149 environmental reports with the characteristics shown in Figure 3.

Type of plan	Municipal spatial plan	Local spatial plan	Sector plan
	75 (all)	50	24 (all)

Year of publication	2004	2005	2006	2007	2008	2009
	3	14	15	13	19	85

Figure 3 Characteristics of the environmental reports included in the document study

The reports have been chosen with the aim of including various characteristics. However, for both the comprehensive spatial plans and the sector plans, all published environmental reports are included in the study for the sake of completeness. Regarding the time of publication, Figure 3 shows a majority of reports from recent years. This is because very few reports were published in the first years after SEA became mandatory in Denmark in 2004. The choice to include all municipal spatial plans and sector plans also affects this, because the majority of these were published in 2009.

The reports were analysed in terms of their integration of climate change. To this article, it is of interest that any occurrence of mitigation and adaptation was registered as well as the assessment of interactions between these and between climate change and other environmental issues. The results are presented in section 3.

2.2 Interviews

On the basis of the document analysis, interviews were conducted with six municipalities. The chosen cases are all SEAs of municipal spatial plans from:

Municipality of Aalborg (North Denmark) 2009
Municipality of Egedal (Zealand) 2009
Municipality of Favrskov (Central Denmark) 2009
Municipality of Ringsted (Zealand) 2009
Municipality of Roskilde (Zealand) 2009
Municipality of Hillerød (Zealand) 2009

The cases were investigated through interviews with key staff in the municipalities who had been leading in preparing the environmental reports. Because the subject area is without previous evidence basis, the interviews were conducted in an open and explorative way in order to uncover the experiences with climate change in SEA. The knowledge obtained through the interviews is used in the institutional analysis and discussions in Section 4.

3 The scope of the integration of climate change into SEA

The analysis shows that climate change is integrated into 57% of the SEA reports, corresponding to 85 of the 149 reports, and that climate change is integrated into an increasing percentage of the reports published each year. This increasing focus on climate change in SEA corresponds well with the increasing focus on climate change in society in general. Especially in 2009, there is an increased integration of climate change into SEA reports. This is largely due to the SEAs of the new municipal plans that were prepared this year, since almost 60% of these included climate change. This could be due to the fact that climate change had particular focus in Denmark in 2009, because of the COP15 in Copenhagen. Also the municipal plans are comprehensive and holistic plans, thus, including many issues of relevance to climate change.

Regarding the approaches to climate change, mitigation is integrated into 51% of the SEA reports, while adaptation is integrated into 14.8% and is thus less common. For both approaches, the analysis shows that they are increasingly integrated. This development so far peaked in 2009, as mitigation was integrated into 68% and adaptation integrated into 25% of the analysed SEA reports.

The document analysis shows that only 12% of the 149 SEA reports include both mitigation and adaptation. A further analysis of the reports shows that one report links mitigation and adaptation directly by looking into the interaction between them. This report is an SEA of the municipal spatial plan for Copenhagen prepared in 2009. The main interactions assessed in the report are those between increased and decreased densification and local drainage of water. For example, in terms of minimising impermeable areas in the city, it is stated that: "*… it has an indirect positive impact on the adaptation to climate change. Less impermeable areas will furthermore minimise the need to pump rainwater and thus decrease energy consumption*" (Municipality of Copenhagen 2009, 33). The analysis also shows that in 9.4% of the SEA reports, interactions between climate change and other environmental issues are assessed. For example, in the municipal spatial plan for Kalundborg prepared in 2009, it is assessed that: "*Using, e.g., solar cells has a positive impact on climate change, but can also impact the surroundings by reflections.*" (Municipality of Kalundborg 2009, 14). The results comprising all the synergies found in the 149 statements are presented in Figure 4. The results indicate a relatively broad span of areas with a main focus on synergies between climate change and other environmental issues, and a limited focus on synergies between mitigation and adaptation. The most frequently assessed positive synergy is 'the reduction of non-permeable surface and, the use of surface water to adapt to climate change increases the bio factor, the recreational opportunities and the attractiveness of urban spaces'. Regarding the negative synergies, two cases are most often assessed: How renewable energy systems like wind turbines and solar cells affect landscape, aesthetics, heritage and population, and how climate change with increased temperature and more frequent flooding affects the quality of drinking water.

The results indicate that climate change is integrated separately into the different professions rather than from an overall approach; hence, the results show that a rather inconsistent choice of context relevance determines the integration of climate change synergies into the SEAs.

Categories	Results from document analysis
Negative climate synergies	• Congestion tax will reduce the energy use for car transport – but will, to some extent, be counterbalanced by the energy use for increased public transport. • The densification of urban areas to decrease car dependency and energy use will potentially decrease the rainwater infiltration needed to adapt to climate change.
Positive climate synergies	• The reduction of non-permeable surfaces to adapt to climate change will decrease the need for energy use for rainwater pumping.
Negative environmental synergies	• New urban development areas worsen the expected drainage of the areas • The use of solar cells and other energy systems can cause reflection and have aesthetic impacts at the local level. • The installation of wind turbines can affect landscape, nature and population. • Climate change and irrigation will influence groundwater for drinking purpose. • Change in nature locations due to climate change. • Adaptation requires economic investments, which cannot be used for material goods, as well as loss of agricultural land. • Climate change leads to changes in water level in low-level areas with consequences for flora and fauna. • Increased run-off will pollute surface waters. • Landscape, church surroundings, architectural and archaeological heritage will be affected by increased water impacts and investments in CO_2 neutral installations like wind turbines and solar installations. • Increased temperature due to climate change increases the risk of bacteria growth in water pipes with impacts on human health. • Increased precipitation increases the flooding risk and thereby the pollution of especially small water supply installations and poor drillings. • The increase in extreme precipitation affects the sewage system.
Positive environmental synergies	• Greening of urban areas to adapt to climate change (temperature and shade) will improve the conditions for biodiversity • The reduction of non-permeable surfaces increases the bio factor. • Extensive farming on low-level areas with a raise of the water head to reduce nutrient discharge will improve the conditions for flora and fauna and create water reservoirs to adapt to climate change. • The reduction of permeable surfaces in combination with green elements in urban spaces and the incorporation of zones for maintaining the water in green areas will together mean economic savings and the creation of attractive urban spaces. • The use of surface water from adaptation as a recreational element in the planning of new urban areas or urban regeneration. • Sustainable transport with increased public transport and bicycling to reduce CO_2 emissions will contribute to a reduction of noise and air pollution, and thereby enhance human health. • The development of recreational path systems can increase the use of the bicycle as a transport mean and decrease CO_2 emissions. • Industrial areas without heavy and environmental pollution industries are positive to air pollution, climate change mitigation and human health. • Climate strategy with decreases in CO_2 emissions and other air pollution components will improve human health.

Figure 4 Synergies found in SEA practice

Thus, which are the consequences of not addressing positive and negative synergies in SEA practice? The consequences are a) a risk of negative synergies and the lack of coherent policies; and b) missed opportunities for exploring and promoting positive synergies while addressing climate change; and c) the suboptimal allocation of resources and policy response.

The remaining question of why the synergies between climate change mitigation and adaptation and climate change and other relevant policy areas are not systematically addressed in practice is explored in the following section.

4 Climate integration in the framework of institutional processes

This paper maps climate change integration into Danish SEA practice, and finds that this integration is incomplete in terms of the assessment of positive and negative synergies. It is interesting to analyse the reasons behind the incomplete integration of climate change measures and their synergies, especially. Reasons of regulative, normative and cultural-cognitive character are suggested as explanations for the lack of assessment of synergies between adaptation and mitigation and other environmental concerns found in the document study.

First, the original understanding of *climatic factors* in Danish SEA has been based on local rather than global climate conditions and on mitigation rather than adaptation. Second, the original normative understanding of the term climate change is separated into two; adaptation and mitigation, where mitigation is seen as an international and national matter and climate change adaptation as a local matter (Biesbroek et al. 2009). Third, the municipal organisational structure consists of different professional silos with their own internal norms, cultures and procedures that may hamper the horizontal coordination across the professional sectors. Fourth, climate change is a new issue to the Danish municipalities. Therefore, this article brings in perspectives and explanatory causality from institutional theory; hence, *"institutional theory seeks to explain the difference between the formal structure and the actual processes in practice"* (Mejlby et al. 2009 p. 147). The formal structure, in this case, is the SEA framework including the assessment of 'climatic factors' and 'synergies and trade-offs'.

4.1 Theoretical framework for institutional elements in the integration of climate change into SEA

To shed light on the above-mentioned issues and how they may affect the integration of climate change and the assessment of synergies in planning practice and SEA, we use Richard Scott's three pillars of institutionalism. This approach highlights the institutional constraints that may characterise the integration process. Statements from the conducted interviews are used to exemplify the institutional factors.

Scott (2001) defines three pillars of institutionalism moving from the 'conscious' to the 'unconscious' level; that is, from the legally enforced to the taken-for-granted frameworks, ranging from regulative systems to normative systems to cultural-cognitive systems:

- The regulative processes concern formalised issues such as rule setting, monitoring and sanctioning activities (Scott 2001). Regulative processes involve the capacity to establish rules, to inspect the compliance with these rules and to create initiatives to influence future behaviour.

- Normative processes include both values and norms. Values are ideas of the preferable that together with standards make it possible to compare and assess existing behaviour and structure. Norms specify how things ought to be done and hereby define legitimate ways of carrying out tasks (Scott 2001).

- Cultural-cognitive processes have cognitive dimensions as a focal point in the understanding that external experiences and stimuli affect the way in which an individual perceives and interprets information. In other words, an individual is a product of its environment (Scott 2001). Symbols, words, signs and gestures are indicators of how shared belief systems are created (Scott 2001). The development of preferences, interpretations and sense-making tends to strengthen "*pre-existing structures of related values and cognition*" (March and Olsen, 1989, p. 41).

Using this framework from Scott (2001), the possible explanations presented are discussed in the following sections.

4.2 The understanding of climatic factors in Danish SEA

In the case of integrating climate change into SEA, spatial planning is a statutory example. Thus, the SEA of spatial plans is required by national law. Furthermore, the assessment of *climatic factors* is statutory, as stated by an official from Aalborg Municipality: *"It is required by law - climatic factors are one of the things you have to look at"*. However, normative factors, such as the understanding of climate change, might help to explain the lack of assessment of climate change concerns and synergies.

When viewing the Danish guidance on SEA, the interpretation of *climatic factors* seems to focus on two things. First, local climatic conditions, e.g., wind and temperature, are mentioned in the definition of the environmental concept of SEA. Second, mitigation, e.g., renewable energy and CO_2, is mentioned as an example of an environmental goal relevant to SEA. Thus, global climate change and adaptation are not specifically mentioned. In society, the normative perception of the term has changed and now the term is increasingly associated with the global climate change, its interactions with local conditions, and its adaptation to possible changes. This survey of the 149 environmental reports indicates that the SEA practitioners' understanding of *climatic factors* is limited by the normative meaning of the term embedded in legislation and guidance. However, this seems to be slowly changing; seen, for example, by the fact that adaptation is increasingly dealt with in the SEA reports.

4.3 The international understanding of climate change mitigation and adaptation

When climate change was first put on the agenda, the focus in both science and politics was primarily on mitigation (Biesbroek et al. 2009). This discourse, with an emphasis on climate change mitigation, has continued to be the dominating one, both scientifically and in policy making (Füssel 2007; Kates 2005, p. 5; Michaelowa 2001; Swart and Raes 2007; Wilbanks et al. 2003; Wilbanks and Sathave 2007). This highlights the fact that linking mitigation and adaptation represents a particular challenge to practice.

Within planning, Biesbroek et al. (2009) have detected a tendency to what they term the "*mitigation-adaptation dichotomy*", where climate change mitigation and adaptation are seen as separate approaches and not viewed holistically. According to Biesbroek et al. (2009), this is linked to the original perception that mitigation and adaptation represented different approaches to meeting climate change challenges, thus, ignoring possible positive and negative synergies between them. Biesbroek et al. find that this division results in different knowledge productions and

approaches and hereby makes the integration of mitigation and adaptation more difficult (Biesbroek et al. 2009). The same issue is touched upon by Bulkeley (2006, 209-10), stating that, in terms of the integration of climate change adaptation into planning, "*there is uncertainty as to how such considerations are being integrated into new regional spatial strategies and local development frameworks, and whether such policies are being prioritized at the expense of addressing those issues of mitigation…*".

Most of the European, national and local policy sectors aim for a holistic approach in policy making with a general conception that, in practice, most strategies operate at one horizontal level from a sectorial perspective. However: "*Measures taken in one policy domain to reduce climate impacts are often not linked to the impacts of these measures taken in another policy domain"* (Biesbroek et al. 2009: 233). That is, the measures fall in between the different policy domains and make the coordination even more important to the integration process. This dilemma does not only occur at the EU level but at all levels, making the integration of the interdisciplinary element of climate change into the bureaucratic organisation complex, as we will discuss in the following section.

4.4 Local structural complexity in terms of organisational fragmentation and bureaucratic silos

Danish municipalities' organisational structure is built upon silos of professional sectors, and, despite a municipal reform in 2007, bureaucratic traditions and procedures characterise the municipal organisations. Mintzberg (1983) finds that the overall departments in these organisations work like divided production lines, which handle different problems and assignments within their own profession very efficiently. The complexity occurs when one problem touches upon more than one profession and falls in between several standard procedures. Most likely, the task will be pushed to one profession instead of being subject to the shared responsibility of several departments. The consequence in the following process is the loss of resources to unscheduled expenses and unsatisfying task management (Mintzberg 1983) – and, as in the case of SEA, the lack of the assessment of synergies.

The municipalities have, with their mix of bureaucracy and division of labour and responsibility, a number of professionally divided silos. Each silo represents a department with several sub-departments. Strong internal linkages can be found vertically in each silo, which, on the other hand, do not exist horizontally between the silos. The horizontal linkages and the coordination and communication between sectors and professions are important to show synergies and trade-offs. The difficulty in municipal horizontal coordination is also based on the fact that the coordination is organised in the municipal frames of negotiations among actors on the same footing, and, to a very limited extent, among individual officials across the silos, and the capacity for horizontal coordination is limited (Christensen and Ibsen 1994, Mintzberg 1983). The division of labour creates barriers to the linkage between different local rationalities across partitions (Cyert and March 1963), and "*different sets of rules tend to evolve independently in different domains*" (March and Olsen 1989, p. 26). That is, different norms and ways of doing things evolve internally in each silo and result in different 'languages'. This difference in organisational sub-cultures makes the communication and cross-sectorial coordination even more complex.

Several Danish municipalities have established climate change as the task of a sub-department in one professional silo, though climate change is cross-sectorial. Two overall experiences have appeared so far. First, the municipalities are not accustomed to working across sectors to the extent that climate change demands: and, secondly, the placement of climate change in one sub-department does not make this task easier. SEA meets the same challenge. Hence, this tool likewise demands horizontal coordination related to one programme or plan, which again poses a

challenge to an organisation that through history has been organised according to one specific professional area and is accustomed to being effective within this area. Climate change integration expresses and emphasises this challenge even more, which adds to the challenge of assessing synergies. The hierarchical silos and their affiliated procedures, norms and cultures are embedded in the officials, and therefore they might not question this set-up.

With its broad concept of environment, SEA is supposed to bridge these sectorial gaps and contribute with a more holistic approach. However, as can be seen from the investigations in this article, in the case of climate change synergies, it does not succeed.

4.5 Climate change: a new issue in planning without linkage to SEA

Furthermore, climate change is a new issue in planning. Municipalities as organisations function best in a stable environment, which implies that the usual procedures and workflows are efficient. However, if a situation occurs which entails high ambiguity and uncertainty and demands the rethinking of methods, the organisation is challenged (Mintzberg 1983). Climate change is characterised by uncertainty. Firstly, no one can predict the precise consequences of climate change. Secondly, there are no national requirements or guidelines on how to integrate climate change into spatial planning and SEA. Thirdly, climate change planning is interdisciplinary and therefore affects most municipal sectors, and the municipalities are not accustomed to the coordinating role which this requires.

The integration of climate change and synergies has to be bent to fit into the existing structures. This is unaccustomed and makes the integration process challenging for the municipalities: "*The new climate change group is an administrative change we notice. (…) It is probably a political aspiration that caused the establishment of the climate change group"* (planner from Ringsted Municipality). This quote indicates that the planners in charge of SEA in Ringsted Municipality have tried to coordinate with the officials in charge of climate change; but that climate change is seen as a new and political topic and the responsibility of another department. Aalborg Municipality is another example, where planning, SEA and climate are seen as separate tasks and responsibilities are placed in three different departments. This makes the task of coordination challenging.

Furthermore, the interviews with officials indicate that not only climate change but also the SEA itself is still in an institutionalisation process: *"It [the work with climate change in SEA] has been very instructive. There is a broader assembly with a larger understanding; we are still working with the development of our concept for environmental assessment. We have more people in the environmental assessment group, among others, people from the sewage department and from the traffic and road department. (…) All of us – also the planners – have had a better understanding that we have to be involved from the beginning. The workflow has to be changed"* (officials from Aalborg Municipality). They also express that the work with climate change takes place in another department and indicate that it is separate from their work. The silos and the division of responsibility are highly embedded in the nature of the municipal workflow. Hillerød Municipality, which did not include adaptation in their SEAs, also expresses this issue; that adaptation is integrated into the sewage plan and is under the authority of another department.

While SEA has a regulatory basis in terms of the EU Directive implemented in Danish planning law, climate change integration is highly normative and, though SEA could be a beneficial tool, climate change is integrated without a strong correlation to SEA. A normative element of climate change is also the fact that working with it may be initiated by society's focus on climate change and, in some municipalities, also by events such as flooding incidents. A planner from Roskilde Municipality expresses the meaning of normative binding expectations: *"For the politicians, it is about CO_2, they*

have signed the Covenant of Mayors[1] and we become a climate community[2], where we will manage our operations". 69 of the 98 Danish municipalities have registered as climate communities at the Danish Society for Nature Conservations (DN 2011), which has thus succeeded in committing local city councils to reducing CO_2 and hereby iniating norm-setting CO_2 reduction (five of the six interviewed municipalities have committed to the climate communities). On the adaptation side, local flooding incidents were the mechanism that initiated the focus on climate change in Hillerød and Aalborg Municipalities. In these municipalities, an underlying municipal perception of obligated responsibility for the citizens is sensed. In some instances, the normative issue of focus may gain a cultural-cognitive element, when working with climate change becomes something which is taken for granted. From the interviews, it seems that the degree of focus on climate change in planning and SEA differs, but that, when it is present, it is an important driver of climate change integration.

5 Conclusion

Responding to climate change is not just a challenge for the different policy sectors, but also a challenge for SEA practice, which is legally bound to assessing 'climatic factors'. The evidence gathered from the SEA reports and from interviews leaves little doubt that SEA practice has a role to play in relation to climate change and that the integration of climate change can have positive consequences. However, the extent to which SEA practice responds to the need for an integrated assessment is questioned. While there is a growing body of literature on both climate change mitigation and adaptation, and on the necessity to keep a complementary scope while assessing the climate challenge, SEA practice tends to focus only on one domain. Research shows that practice is not incorporating a broad scope. The focus is mostly on mitigation, while less is placed on adaptation and the assessment of synergies among climate change mitigation, adaptation and other environmental policy areas is very limited. The lack of a systematic and integrated assessment of synergies indicates that:

- The potential to explore and promote positive synergies while addressing climate change in SEA is great and unexploited, and
- The risk of trade-offs and loss of climate change benefits is high.

The scope is getting broader though, and is seen as a growing recognition of the need to explore important synergies.

5.1 Climate change integration through SEA is part of an institutionalisation process

The integration of climate change into SEA must be seen as a part of the beginning of an institutionalisation process. This entails ambiguity and challenges the existing procedures, norms and institutional legitimacy, caused to a certain degree by its demand for cross-sectorial coordination in a fragmented organisation. There are several reasons for this situation and together they may be part of the explanation for the lack of synergies in SEA.

Climate change mitigation and adaptation were originally perceived by the IPCC as two different approaches and this understanding has also been pursued at the national and local levels. The

[1] The **Covenant of Mayors** is a commitment under the European Commission by which signatory towns and cities are committed to going beyond the objectives of EU energy policy in terms of reducing CO_2 emissions through enhanced energy efficiency and cleaner energy production and use (European Commission 2011).

[2] The Danish Society for Nature Conservation is one of the largest NGOs in Denmark and runs a commitment programme for municipalities on climate change (DN 2011).

original understanding of the assessment of 'climatic factors' was focused on local conditions, and the change of focus to global issues does not yet seem to have reached the tool in practice. However, local institutional factors also highly influence the integration process. The bureaucratic municipal organisation is built upon professionally divided silos with no strong traditions of cross-sectorial governance. Climate change, though it is perceived as interdisciplinary, is managed from specialised sub-units making cross-sectorial coordination difficult. Furthermore, the integration of climate change in the Danish context is initiated by normative reasons and is not closely associated with SEA, even though the tool has a potential to ease the integration process. Figure 5 summarises the different regulative, normative and cultural-cognitive elements of importance to the integration of climate change into SEA.

Regulative	Normative	Cultural-cognitive
Climate change included in SEA legislation	Perception of 'climatic factors' as a microclimate issue rather than global, and as an issue of mitigation rather than adaptation	Silos in organisations: Different cultures
Lack of climate change guidance and support	Perception of climate change mitigation and adaptation as separate phenomena	Mimetic and recognizable organisational integration of climate change into hierarchical structures
	Silos in organisations: Different norms and values	
	Binding and accredited expectations of focus on climate change	

Figure 5 Summary of the institutional elements of relevance to climate change integration

Climate change integration into SEA may, from the point of view of the authors, be regarded as being in an institutional void, with institutional conflicts as the following consequence. It is indicated that climate change does not possess clear institutional characteristics as a municipal professional area; it falls between the silos, and the potential of SEA is not fully exploited. Therefore, it is viewed as a void with "*…no clear rules and norms according to which politics is to be conducted and policy measures are to be agreed upon*" (Hajer 2003 p 175). Institutions governing in a void will lack resources and legitimacy and will therefore not have the capacity to govern (Koornstra 2010). Yet another element that indicates that international and national guidance is needed. It is our opinion that SEA can play a much larger role in the integration process than what is experienced from the current practice. The institutionalisation of climate change integration has begun. However, it is unknown whether the municipalities will be successful in developing the governing capacity needed.

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