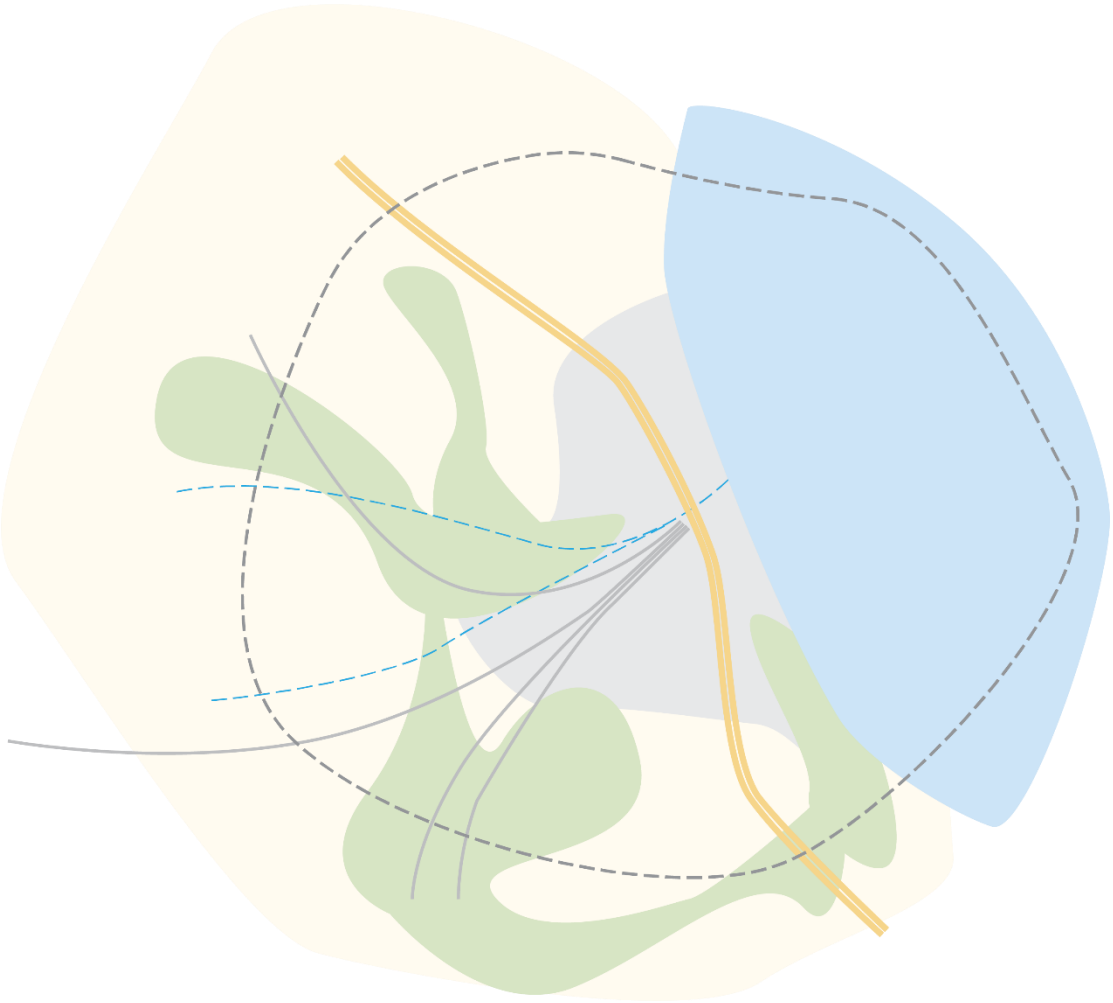

Ecosytems-Based Planning

Challenges and Opportunities

Mads Sahl Torjusen

Master's Thesis in Urban Planning & Management
Aalborg University

07/06 - 2024

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Abbreviations and Acronyms

AWG	Anthropocene Working Group
CBD	Convention on Biological Diversity
CO_2e	Greenhouse Gas Emissions
ES	Ecosystem Services
ICS	International Commission on Stratigraphy
TEEB	The Economics of Ecosystem & Biodiversity
UN	United Nations
PAN	Protected Areas Network
PLN	Protected Landscapes Network
PEN	Protected Ecosystems Network
UES	Urban Ecosystem Services

ECOSYSTEM-BASED PLANNING
CHALLENGES AND OPPORTUNITIES

Abstract

This master's thesis on the programme Urban Planning & Management at Aalborg University sets out to uncover how ecosystems-based planning can be adopted into Danish planning praxis through increasing the plannability of nature. Taken its point of departure in the understanding of ecosystems-based planning from Hammond & the Silva Forest Foundation (2002), an understanding of urban ecosystems-based planning is formulated, better fitting into the Danish planning regulation and context. Furthermore, the very concepts of ecosystem services and biodiversity are explored, as well as the rationalities used in policy discourse.

Using the recent planning of the municipality of Aarhus, how urban ecosystems-based planning already is utilized is identified. This is done in two parts – first identifying the ambitions and focus areas of the plans and policies, and secondly through exploring the practical implications of these ambitions and focus areas through examining three cases of concrete planning initiatives: Aarhus Ø, Vesterbro Square and Frederiks Avenue. The first part thoroughly uncovers how the municipality of Aarhus has substantial ambitions of improving both the quality and variation of nature in and outside of the city. This is done through both recent plans, and an addendum to the municipal plan, concretizing which measures and initiatives is implemented statutory to ensure this development. The second part finds that the practical implication is difficult as of now concerning Vesterbro Square and Frederiks Allé, but that on Aarhus Ø as a waterfront regeneration project has experienced an increase in urban ecosystem services and biodiversity.

Concluding the thesis, it is assessed that new concepts of value, growth and profitability is needed in order to incorporate an ecosystems-based planning into Danish planning praxis. Several shortcomings and challenges of the approach is furthermore addressed and recommended for further research.

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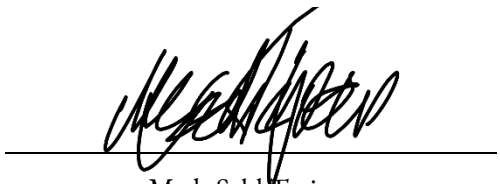
Aalborg University

Preface

This project is written by a student on the Master's programme in Urban Planning & Management at Aalborg University as the final thesis. Several people have contributed to a larger or lesser degree in the writing of this thesis. First and foremost I would like to extend a thanks to my supervisor Birgitte Hoffmann for the varied, thoughtful, challenging and in-depth supervision sessions. Many aspects of this thesis I would not have explored if not for you. Secondly I would like to thank Bente Lykke Sørensen, city strategy officer at the municipality of Aarhus, for wanting to do an interview on such a short notice, and also for providing me with additional material on the development of Aarhus Ø. Thirdly, I would like to thank my unofficial study group who provided good company, thoughtful discussions and binding agreements to structure an otherwise unstructured semester. Lastly I would like to thank the many people who I have discussed this project with, and their insights into previously unexplored avenues of this thesis.



Mads Sahl Torjusen
mtorju19@student.aau.dk

Executive Summary in Danish

Nærværende speciale har sit akademiske udgangspunkt i en tilgang til planlægning, som sætter økosystemer og biodiversitet forrest når der laves byudvikling og projekter i det åbne land. Interessen for at overføre denne tilgang til den danske planlægningskontekst stammer fra en undren om, hvorfor dette ikke allerede er gjort. Dermed bliver omdrejningspunktet for dette speciale først og fremmest at afdække den såkaldte økosystembaserede planlægningsmodel, og dernæst identificere hvordan den kunne implementeres i Danmark. Aarhus Kommune, mestendels med fokus på Aarhus by, bliver her taget som case som en kommune, der har indført dele af den økosystembaserede planlægningsmodel – dog uden nødvendigvis at de er opmærksomme på det eller at det er fuldstændigt én til én. Ordet 'planlægningsbarhed' introduceres også som et nogenlunde centralt begreb, og især naturens planlægningsbarhed sættes der fokus på. Brugen af ordet stammer fra en videnskabelig artikel skrevet af Jensen et al. (2017), der afdækker hvordan genopfindelsen af cyklen ud fra dens sundhedsmæssige, og dermed samfundsøkonomiske, værdi er blevet brugt til at få cyklen ind som central del af planlægningsbilledet. Især også som en vigtig spiller med hensyn til at skabe mere grøn mobilitet. Tanken ved at benytte ordet i sammenhæng med økosystemer og biodiversitet er dermed at afdække hvordan en lignende udvikling kunne ske for helt eller delvist at indføre en økosystembaseret planlægningsmodel. Dette leder frem til problemformuleringen for specialet *(oversat fra engelsk)*:

> Hvordan kan en øgning af naturens planlægningsbarhed være i sammenhæng med indførelsen af en økosystembaseret planlægning?

Ud fra problemformuleringen formuleres tre underspørgsmål, der henholdsvis sætter rammerne for litteraturgennemgang, analysen og diskussionen. Disse vises ikke her, men kan ses på side 3 i introduktionen. Litteraturgennemgangen åbner med en belysning af begrebet 'værdi' specifikt i brugen af ordene 'økosystemtjenester' og 'biodiversitet'. Fokusset ligger primært på både at afdække begreberne i konteksten af nærværende projekt, men også hvilke rationaler der ligger bag brugen af dem i diskurser ud fra Jax & Heinks (2015) typologi. Hernæst sættes der fokus økosystembaseret planlægning ved brug af Hammond & Silva Forest Foundations (2002) principper og procesbeskrivelse. Hertil er også et afsnit om urbane økosystemtjenester og den værdi de har i både beskyttelsen af byer, temperaturregulering, iltrensning mv. Afslutningsvist udarbejdes en forståelse af hvad urbant økosystembaseret planlægning er, som også sætter planlægningstilgangen ind i en mere dansk kontekst, samt en konceptuel ramme, der samler begreberne i litteraturgennemgangen og sætter dem i relation til hinanden.

Analysen er todelt og har sit udgangspunkt i to planer, én politik og tre case områder indenfor Aarhus kommune. I første del er der en dokumentanalyse i form af en indholdsanalyse, der fokuserer på at afdække hvordan hensynet til økosystemer og biodiversitet fremgår i førnævnte dokumenter, samt hvilke konkrete ambitioner og fokusområder de fremlægger og værktøjerne

der foreslås at bruges for at komme i mål med ambitionerne. Hertil er også foretaget et interview med bystrategisk chef i Aarhus Kommune, Bente Lykke Sørensen, samt brugt erfaringer og viden fra et tidligere projekt om Aarhus Ø, der er eksplicit reflekteret over i rapportens metodologi kapitel. Her identificeres der, at Aarhus Kommune, med de relativt nye planer og politikken, har en høj ambition om at arbejde aktivt med genopretning af naturområder, fremhævningen og etablering af økologiske korridorer, samt at sikre kvalitets og varieret natur i byen, der kan tilgodese biodiversitet. Den primære argumentation sker fra et ressource-beskyttende rationale, hvor økosystemer og deres tjenester tilgodeses for at beskytte byområder, naturressourcer som grundvandet samt at være rekreative områder for mennesker, dog igen med varieret og kvalitets beplantning som et hovedgreb. Dette konkretiseres igennem temaplanen 'Et Grønnere Aarhus med mere Blåt', der blandt andet indfører en grøn norm, samt fremsætter et krav om, at alle lokalplanpligtige projekter skal indeholde mindst 5 % varieret og kvalitetsnatur, der tilgodeser biodiversitet, på deres ubebyggede områder. I de konkrete cases flyttes fokusset til henholdsvis Aarhus Ø, Vesterbro Torv og Frederiks Allé, der er planlægningsprojekter af varierende størrelse samt af forskellige karakteristika. Disse benyttes til at forstå hvad de praktiske implikationer er af idéerne og ambitionerne fra planerne og politikken. Hvad der identificeres her er todelt – først og fremmest viser Aarhus Kommune en stærkt ønske samt initiativ til at være en aktiv grundejer og developer, der går forrest ift. At introducere grønne elementer og levemåder ind i byen. Dernæst kan der konkluderes, at dette er relativt ustabilt, og er meget afhængig af både det politiske flertal i byrådet samt hurtigt kan ændres til næstkommende kommunalvalg hvis flertallet flytter sig. Diskussionen behandler dernæst hvilke faldgruber og ulemper en urbant økosystembaseret planlægnings tilgang kunne have, hvilket identificeres igennem to diskussionsemner – en diskussion om vækst- og værdibegreber, og hertil en diskussion om naturen overhovedet bør være en del af det urbane, når det ville være bedre at planlægge i det åbne land.

Slutteligt konkluderes problemformulering, hvor der identificeres, ud fra arbejdet med Aarhus Kommune, at en konkretisering af naturens værdier, og dermed planlægningsbarhed, er nødvendigt hvis en økosystembaseret, og specifikt urbant, tilgang skal have nogen gangbarhed. Hermed tilføjes der også, at der bør ske en anerkendelse af det hierarkiske forhold mellem økosystemer, menneskelig kultur og økonomi. At sunde økosystemer medfører bæredygtige menneskelige kulturer og økonomier, og dermed også mere bæredygtige byer.

Table of Contents

List of Figures and Tables

Figures

Tables

The planners have one idea of the good life, (...) but the market and the realtors have another narrative. (...) many dream of a life, that isn't possible within the planetary boundaries.

Authors translation, the Municipality of Køge in Wulff (2024)

If our society believes that Earth is borrowed from our children rather than inherited from our ancestors, we will use ecosystem-based planning to protect, maintain, and restore healthy ecosystems and biological diversity, and to develop diverse, ecologically sustainable economies.

Hammond & Silva Forest Foundation (2002:1)

Chapter 1. Introduction

Humankind has historically been – and are currently – dependent on various ecosystem services (ES) as a provisioning, supporting, and regulating entity to contribute to human well-being, progress, and development (Millennium Ecosystem Assessment, 2005). ES, and the anthropogenic utilization of them, have formed the very basis for civilization (Russo & Cirella, 2021). Human well-being and the state of ecosystems are inextricably linked. Though the former is an anthropocentric view on ecosystems value for humans, it plays an important role in understanding why it is important to protect, restore and maintain ecosystems for both humans and Earths survival. This is best exemplified by the fact that the United Nations (UN) has declared the years of 2021 - 2030, 'the Decade on Restoration of Ecosystems' (United Nations, n.d.). ES are an integral part of the daily lives and survival of all living things on Earth, but decades of human overconsumption, rapid industrialization and urbanization has marginalized and even destroyed ecosystems, resulting in the aptly called triple interlinked planetary crisis currently facing humankind – climate change, biodiversity loss and pollution (United Nations Climate Change, 2022). Furthermore, in 2023 Richardson et al. found that six out the nine planetary boundaries had been transgressed, which was linked to anthropogenic activity.

In the past century a popular way of denouncing the current epoch we are living, taking also the former into account, is the so-called *Anthropocene*, also known as *the great acceleration*, calling back to Anthropos hyper-agency in changing Earths ecological systems on a global scale (Chwałczyk, 2020). Though recently[1] voted down by a 12 to 4 majority in the International Commission on Stratigraphy's (ICS) subcommission on Quaternary Stratigraphy, the proposal has nonetheless left an impact (Voosen, 2024). The reasons for voting it down all coming down to the Anthropocene Working Group's (AWG) proposed date for when the epoch would have started – the 1950's (ibid.). Some stating that this would not be definitive enough, and others doubting one could even affix a date for the human influence on the planet (ibid.). Nevertheless, other researchers across multiple sciences have put in a bid for other proposals of -cenes, of which Franciszek Chwałczyk (2020) from the Department of Cultural Urban Studies at Instytut Kulturoznawsta in Poland has compiled a list of eighty -cenes, each trying to act as counterproposals or critiques of the Anthropocene. Chwałczyk himself uses these as a way to build upon what he calls the Santa Fe's Institute *Urbanocene* – an expansion upon the

[1] As of writing this

proposition of the same name brought forth by Geoffrey West in his book on scales (ibid.). The concept of the Urbanocene stems from an understanding of the urban as a complex of interlinked socio-spatial systems, which has both internal and external impacts on the world within which it operates (ibid.). However, these impacts are not only on its immediate surroundings, but also crosses borders. An example of this would be the production of foodstuffs to feed the population – the bigger the urban environment, the larger the amount of foodstuffs needs to be produced, which typically entails importing to satisfy demand. In the same way, import of technology constitutes another value-chain of which the urban is a large consumer. Internal impacts are typified by urban heat islands, whereby grey infrastructure contribute to heating cities, production of greenhouse gas emissions (CO_2e), deterioration of mental health, and encroachment of nature through urban development. An estimated around half of earths population lives in urbanized areas, and this is expected to rise to 68 % by 2050, with most of the development happening in Africa and Asia (UN-Habitat, 2022). To put it in concrete numbers, that is an increase of about 2.2 billion people. (ibid.).

Taking all of the former into account, the impact urbanization has had on earths climate and ecosystems is undoubtable. An increase in people living in ever-expanding urban environments has put immense pressures on all scales – from the local all the way to the global. With the majority of cities situated in coastal areas, the visible impacts of climate change are undeniable. The rise in frequency of floods and storm surges has not only caused extensive property damage but also claimed numerous human lives (Juniper & Windsor, 2013). However, as much as the Urbanocene is a part of the problem, so can the urban contribute to solve the crisis facing earth. In their memo *On the Emergence of an Ecological Class*, Latour & Schultz (2022) discuss a now concept of growth based on the planets condition and general liveability, which then forms the basis of the modern class struggle. This class struggle is not to seize the means of production, but rather to ensure a habitable, liveable, and ecologically sustainable planet for current and future generations. While philosophical in nature and filled with platitudes, it still speaks into an urban planning debate. The ecological class is not a clearly defined group of peoples, but a common connection between a plethora of organizations, environmentalists, and individuals. As formerly stated, the urban is a complex of systems with both external and internal impacts on the planet and human lives, but what shapes these systems are in the end the polity, chosen by the peoples. If an ecological class were to band together for political change, it could make future urban development take ES into account, which is not unthinkable when thinking about the general consensus amongst both citizens and policy-makers to enact environmental protection and restoration.

This thesis seeks to explore a relatively new planning approach, which works systematically and holistically with ecosystems, put into the context of Danish urban to suburban settings. The specific focus is to shed light upon how Danish planning better can incorporate this approach to combat - or at least contribute to combatting - the crisis facing Earth. Pertaining to the *raison d'être* for this thesis, a gap in the literature has been found relating to that of using an ecosystem-based planning approach in Denmark. While a larger focus has been attributed to the importance

of including nature-based solutions and its hybrids in concrete planning scenarios to combat climate change, as well as an increase in funding for green solutions including biodiversity, sparse to no literature nor research has been done on the topic of introducing a systematic approach to ecosystem-based planning in suburban areas in Denmark. Furthermore, a critique of current planning praxis is raised, as the inclusion of nature and biodiversity seems to much more an afterthought rather than a focal point – or in the cases where it starts as a focal point of a plan, in the actual realization it is scaled down to recreative greenery or sparse shrubbery. Adding to this, the values driving this same inclusion is typically from an anthropocentric perspective – i.e. nature *because* of its instrumental value – rather than an ecocentric – i.e. nature *because* of its intrinsic value.

Following the above, and to steer the writing of this thesis as well as scope in, a research question along with two sub research questions have been proposed. They are as follows:

> How can the enhancement of nature's plannability in urban environments align with the integration of an ecosystem-based planning approach into Danish planning praxis?

1) What role does the application of ecosystem services and an ecosystem-based approach play in ensuring sustainable development and quality of life in urban areas?
2) In what ways does the municipality of Aarhus incorporate an urban ecosystems-based planning approach into their urban planning strategies?
3) Which shortcomings could an urban ecosystems-based planning approach have?

For the sake of clarification, as well as to ease the reading of this thesis, the following section will treat the project design.

1.1. Project design

The main research question poses the overall theme for this thesis, which is to identify possible approaches to implementing an ecosystems-based planning approach into a Danish urban planning context. A way of doing this could be through enhancing the plannability, which will be elucidated in later chapters. Following the main research question, three sub questions are proposed, which should contribute the finding an answer to the main research question. The first sub question seeks to find an understanding of *urban* ecosystems-based planning approach through elucidating the concepts of ES and the ecosystems-based approach as proposed and described by Geneletti et al. (2020), Hammond & the Silva Forest Foundation (2002), and Laidley (2017). A special focus will also be on the rationales (also called motives) when using the concepts of ES and biodiversity in policy discourse. Here, the typology of Jax & Heink (2015) is found most advantageous. This leads to the creation of an understanding of urban ecosystem-based planning, which will be utilized as the basis for what is meant the formerly mentioned concept is used. Following this, a conceptual framework is proposed for how ES rationalities and urban ecosystem-based planning interface, as well as their interlinkages. The former is done in Chapter 2.

The second sub-research question delves into the planning strategies for the municipality of Aarhus with an explicit focus on identifying in what ways an urban ecosystem-based planning approach is already utilized. A focus on the municipality of Aarhus has been chosen through previous project work with the municipality, wherein traces of previously mentioned approach was found. The methodology is presented in Chapter 3. , wherein an analytical framework is proposed containing three empirical questions posited to structure the analysis, focusing first on the ambitions and focus areas of current policies and overall plans, and afterwards delving into current concrete planning initiatives. This serves to provide examples of the practical implications previously mentioned policies and plans have, thereby tying the abstract and practical levels together. After the sections treating each question, a sub-conclusion is provided which both serves to summarize the results of the respective section and provide an answer to the question it treated. Lastly, in the analysis, a section summarizes the whole of the analysis, providing an answer for the second sub-research question. Chapter 4. constitutes the analysis, which opens with a section briefly uncovering the planning history of Aarhus, followed by the two aforementioned sections treating respectively the ambitions and focus areas of chosen plans and policy, and afterwards the concrete planning initiatives.

Sub-research question three is treated in the discussion which appears in Chapter 5 with a focus on uncovering the shortcomings of the proposed urban ecosystems-based planning approach. In this way, the discussion serves to criticise the approach, using primarily the results of the analysis. This is done in twofold – first exploring the subject matter of growth ideals, and afterwards the topic of whether planning for nature really is relevant in urban settings. Following the above is the conclusion in Chapter 6. Here the main research question is answered through the utilization of the answers for the three sub-research questions. The chapter opens with a summary of these answers and how they were achieved, to afterwards delve into answering the main research question. Additionally, the results will be put into a broader perspective, and suggestions for future research is presented.

The project design is visualized in Figure 1.1 on the next page.

Chapter 1
Introduction

Chapter 2
Literature Review

Sub-RQ#1

What role does the application of ecosystem services and an ecosystem-based approach play in ensuring sustainable development and quality of life in urban areas?

Section 2.1
The Value of Nature
What are the different perspectives on the value of nature? How is it used in policy-discourse? How can it be used in a planning context?

Section 2.2
Ecosystem-Based Planning
What is an ecosystem-based planning? What are ecosystem services? What are urban ecosystem services?

Section 2.3
Building a Framework
Using the concepts introduced in previous sections to build a conceptual framework and understanding of urban ecosystems-based planning

Chapter 3
Methodology

Section 3.1
Philosophy of Science

Section 3.2
Research Design

Section 3.3
Choice of Case

Section 3.4
Research Methods

Section 3.5
Reflection on Sources of Data

Section 3.6
Analytical Framework

Chapter 4
Analysis

Sub-RQ#2

In what ways does the municipality of Aarhus incorporate an urban ecosystems-based planning approach into their urban planning strategies?

Section 4.1
Planning History of Aarhus
What has influenced the planning of the Aarhus of today, and how does it effect the current planning environment?

Section 4.2
Ambitions and Focus Areas
Treating question one and two proposed in the analytical framework with a focus on one policy and two plans.

Section 4.3
Concrete Planning Initiatives
Treating question three as proposed in the analytical framework, with a focus on the practical implications of the policy and plans.

Section 4.4
Summary of Results

Chapter 5
Discussion

Sub-RQ#3

Which shortcomings could an urban ecosystems-based planning approach have?

Section 5.1
Economy v. Ecology?
A new Ideal for Growth

Section 5.2
Urban with or against Nature?

Chapter 6
Conclusion

Figure 1.1 Project design

Chapter 2. Literature review

This literature review serves to elucidate sub-research question 1: What role does the application of ES and an ecosystem-based approach play in ensuring sustainable development and quality of life in urban areas? To address this, the review begins by exploring the concept of ES and biodiversity from different perspectives, using Jax & Heink (2015) as a foundational reference. Following this, the principles and processes of the ecosystem-based approach, as outlined by Hammond & the Silva Forest Foundation (2002), will be described.

Next, the review will delve into the concept of urban ES, highlighting its urban implications and relevance. This section aims to build an understanding of an urban ecosystem-based planning approach, which will be elaborated on in Box 2. Establishing this understanding is crucial for ensuring clarity and a common ground when discussing the ecosystem-based approach in urban planning contexts.

Finally, a conceptual framework will be presented, consolidating the concepts and theories discussed in the review. This framework will clarify the interfaces and linkages between these concepts, providing a coherent basis for the subsequent analysis.

2.1. The Value of Nature

What constitutes and does not constitute nature? What should be protected, restored and/or maintained, and adversely, should not? Should the value of nature, ES and biodiversity be measured through the eyes of man – *anthropocentric* – or does it have an intrinsic value independent of human influence – *ecocentric*? These, and many other, questions of a philosophical nature have been discussed and dissected thoroughly through many a papers and scientific articles. Not only because it is important to clarify the very concept of nature, but also because the answer in many cases determine where the focus of protection and restoration of nature lies. It is an admission of this paper, that a mix between what in the aforementioned can be seen as the two extremes of anthropocentrism contra ecocentrism, is the general understanding of the value of nature put forth, whereby nature is seen for both its instrumental and intrinsic value, especially in relation to human well-being. To further clarify and thereby scope in on what is concretely meant when writing about the value of nature, and also to contribute to an analytical framework used later in this paper, this section seeks to explore just

this. The typology of Jax & Heink (2015) will be used as primary literature to explore this, though other literary works will be included to either substantiate or clarify.

In their paper, Jax and Heink (2015) seek to find the of biodiversity in an ES-discourse, as per also the title of their paper. As a main argument for the relevance, it is argued that it would contribute to heighten the academic, intellectual and overall political debate, to clarify the place of biodiversity in aforementioned discourse (ibid:2). Furthermore, it is to shed light on whether biodiversity in of itself is an or leads to ES. To do this, they argue that it is not only the biophysical aspects that must be discussed, but it is equally as, if not more, relevant to discuss their interconnectedness through a values-based perspective, definitional perspective and strategic perspective (2015:2). They argue that these perspectives serve to put into light aspects of the biodiversity-ES debate, that is often neglected because of typically looking at only the biophysical connections (ibid.).

Definitional Perspective

The definitional perspective focuses on how one defines biodiversity and ES – as there are no one agreed upon definition for either, but rather a plethora that highlight different aspects of both concepts. Which definition one chooses then highly influences how one talks about and acts on ES and biodiversity conservation and/or restoration. For the sake of clarification, when writing and treating biodiversity in this thesis, unless otherwise specified, the definition from The Convention on Biological Diversity (CBD) is used, i.e:

> "Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
>
> The Convention on Biological Diversity (n.d.)

And when writing and treating ES, the definition of the Millennium Ecosystem Assessment (MEA) will be used:

> (...) the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services such as the regulation of climate, floods, disease, wastes, and water quality; cultural services such as recreation, aesthetic enjoyment, and spiritual fulfillment; and supporting services such as soil formation, photosynthesis, and nutrient cycling.
>
> Millennium Ecosystem Assessment (2005:1-2)

This, and most other definitions of ES, put human well-being as the central starting and ending point for the very reason why a focus should be put on the maintenance, restoration and protection of ecosystems (Jax & Heink, 2015). However, Jax & Heink presents an alternative conceptual framework which the United Kingdom National Ecosystem Assessment has used to delimit ecosystem services from structures and processes or anthropocentric benefits, as seen adapted from their article in Figure 2.1 (ibid:199-200). While still containing human well-being

and benefits derived from ecosystems for humans, it further proposes that these exist independently from humans and provide these benefits regardless of human or societal awareness, as symbolised by the grey arrows. However, humans can promote certain systems and components.

Values-Based Perspective

The value-based perspective ties very much into Figure 2.1, as in human well-being typically being the determining factor in what is and is not valuable and therefore relevant to protect (Jax & Heink, 2015). This is not only in terms of ES' ability to fulfil basic human needs, i.e. the instrumental values, but also the general societal and cultural impacts ES play in relation to human well-being and history, i.e. the non-instrumental (ibid.). Jax & Heink further proposes the need to also consider the intrinsic value of ES, i.e. the value ES has regardless of its contribution to human well-being. In Figure 2.1 this is symbolised by the grey arrows. The methods for evaluating the worth of ES are greatly impacted by whether one attributes its values in relation to its instrumental, non-instrumental or intrinsic values. The Economics of Ecosystems & Biodiversity (TEEB) is one such organization, that tries to emphasize the economic values – i.e. instrumental values – of ES. More on why this would be below in 0 Strategic Perspective.

While the value of ES is typically formed from which perspective one sees it in relation to – or not to – humans, biodiversity as a neologism has an inherent assumption that higher equals better (Jax & Heink, 2015). Where biodiversity then differs in relation to how one values it, is in terms of what is and is not 'wanted' biodiversity, typically through the debate of 'alien' versus 'native' species (ibid.). One could believe place-specific species should be the only species allowed in an area, while another could be of the opposite opinion, that in evolutionary terms introducing new species is better (ibid.).

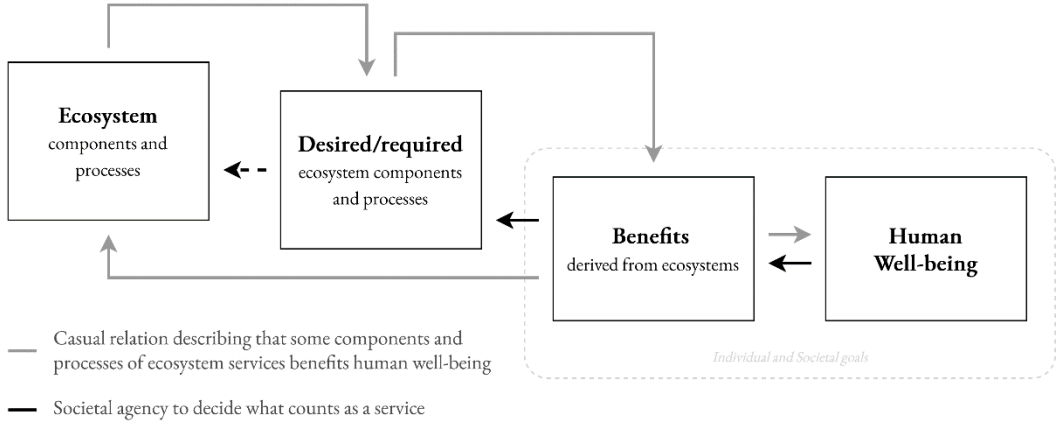


Figure 2.1 Conceptual framework for ecosystem services, adapted by author from Jax & Heink (2015:200)

Strategic Perspective

Jax & Heink (2015) point to a newer, though not as prominent, way of using biodiversity and ES in policy discourse – strategically. Similar to Jensen et al. (2017) and their description of the reinvention of the discourse on bicycles for the provision of sustainable urbanism and traffic

safety, so has ES and biodiversity experienced a change in how policy-makers and proponents argue for its inclusion in politics and planning – specifically its economic viability. As has also been pointed out in the introduction of this thesis, a manifold of political institutions and research papers, including this one, quickly points out the anthropocentric values of ES and biodiversity for humans – in other words its instrumental value. Whether this be its benefits for human well-being – either seen or unseen – or its benefits on production of e.g. wood or foodstuffs. This provides an overall economically viable framing for why one should focus or provide space for ES and biodiversity in public policy and planning, which in of itself is the central mission statement of organisations such as TEEB (n.d.).

The strategic perspective thus provides an important though anthropocentric framework for the inclusion and promotion of ES and biodiversity in decision-making processes and planning. Especially in a world, where most if not every public initiative is weighed against its socio-economic impacts. As Jensen et al. (2017) points out in the case of the inclusion of bicycle in infrastructure planning, using the economic viability is of great importance for sustainable urban environmental governance.

2.1.1 Ecosystem-Service Typology

Jax & Heink (2015) summarizes the above by suggesting three motives for using the links between biodiversity and ES in discourse – the didactic, item conservation and resource protection motives. In this thesis, they will instead be called 'rationales', as it is deemed more fitting. The rationales can be seen summarized in Table 2.1.

Rationale	Biodiversity definition	Values reference	Location/place identity
Didactic	Coarse/unspecific: "life on earth"	Not differentiated	Irrelevant
Item conservation	Typical number and identity	Intrinsic or other non-use values	Place specific
Resource protection	Functional diversity, number	Use values	Variable, in general not referring to the identity of place

Table 2.1 Rationales for using ecosystem services in discourse. Adapted from Jax & Heink (2015:203)

Of course, the rationales in Table 2.1 are a on a general level when identifying motives for using ES and biodiversity in discourse. Reality is often more nuanced. However, they can help in providing an insight into *why* and *how* policymakers, planners or other actors use biodiversity and ES in discourse. It can also help in inferring underlying assumptions about *what* is meant in the usage of aforementioned words.

2.2. Ecosystem-Based Planning

A central approach of this thesis is that of the so-called *Ecosystem-based planning*. But what is this approach, where does it come from, what does it entail, what *are* 'ecosystems' in an urban setting, and how is this relevant for urban planning? The present section will seek to answer these questions.

The ecosystem-based planning approach can be traced back to the regeneration of the waterfront in Toronto in the 1990s, which spawned from a need for a planning approach which was both inclusive and sustainable (Laidley, 2017). Furthermore, a wish to reestablish the link between nature-society was proposed, as further described by the Royal Commission on the Future of the Toronto Waterfront:

> Ecosystem planning (...) produces 'more effective and creative solutions' than traditional planning owing to its concentration on understanding the interactions in ecosystems, its long-term view of change, its focus on diversity, heritage, environmental capacity, and flexibility, and its inclusionary mode of decision making
>
> Laidley (2017:203-204)

It was asserted that employing this planning method was crucial for Toronto to rejuvenate its waterfront, enhancing both its health and functionality (Laidley, 2017). Toronto's Ecosystem Approach to planning has led to what some describe as the finest waterfront globally and is lauded as a prime example of environmental planning (ibid). This approach emphasizes environmental sustainability, habitat protection, and wildlife regeneration to make areas more appealing to developers and private investors, thus yielding social and economic advantages, though initially launched as a bid for the placement of the Olympics in Toronto (ibid.). Recognizing the intrinsic link between nature and society, and the vital role of healthy ecosystems in human well-being, Toronto's planning also emphasizes the significance of local and regional coordination and the integration of green infrastructure (ibid.). This innovative planning approach for waterfront revitalization, involving public-private collaboration and stakeholder engagement, aims for a livable, environmentally sustainable, and appealing waterfront (ibid). Establishing Stakeholder-Roundtables, where all relevant stakeholders have an equal say in waterfront planning, reflects this integrated approach (ibid.).

Following the above, in 2002, Hammond and the Silva Forest Foundation released a working paper proposing principles and a process for protecting and restoring ES in planning. Most importantly, it lays out a planning framework in which first foremost ecosystem protection and restoration are considered, and then how human activities can function within these boundaries in the long-terms without disturbing or reducing biodiversity or ES provision. It therefore both works on a spatial and temporal scale, wherein the former furthermore contains *all* spatial scales, i.e. the national, regional, local and place. It is a therefore a nature-first approach, which recognises the links between human activity and the impacts it has on the natural environment. This approach seeks both to protect, maintain and restore ecosystems wherever possible. It

therefore both deals with the urban, suburban and the open land. However, in the context and interest of this thesis, it will mostly deal with the urban, especially in terms of rejuvenation of brownfield areas.

Principles and process

Hammond & the Silva Forest Foundation (2002) proposes seven principles for an ecosystem-based planning approach:

1) Focus on what to leave, not on what to take.
   Focus on leaving fully functioning ecosystems and increasing biological diversity at all spatial levels through time.

2) Recognize the hierarchical relationship between ecosystems, cultures and economies.
   Economies are part of human culture and adversely, human culture is part of ecosystems. Protection of ecosystems therefore leads to healthy cultures and economies.

3) Apply the precautionary principle to all plans and activities.
   Decisions, interpretations, plans and activities must err on the side of protecting ecosystem functioning as opposed to resource exploitation.

4) Ensure that the planning process is inclusive of the range of values and interests.
   Planning must provide a basis for the participation of people affected by the plan, who represent the full spectrum of values of interests. Must aspire to an egalitarian approach to planning.

5) Protect, maintain, and, where necessary, restore ecological connectivity, and the full range of composition, structures, and functioning of enduring features, natural plant communities, and animal habitats/ranges.
   Planning must ensure ecological interconnectivity, especially in terms of reestablishing lost linkages as well as having special focus on areas likely to be altered due to human settlement and economic activity.

6) Provide for diverse, ecologically sustainable, community-based economies.
   Economies must facilitate a diverse range of activities focused on fulfilling both individual and community needs, as well as on protection and maintaining natural capital. Ecosystems must be healthy and diverse.

7) Practice adaptive management.
   Working within the constraints of the precautionary principle and ecological responsibility, undertake a variety of activities which must be continuously evaluated in terms of their maintaining or restoration of ecological health and biological diversity.

Adapted from Hammond & Silva Forest Foundation (2002:2-3)

Utilizing these seven principles, which should be independent of either context or time, planning should in theory inherently be able to protect and restore ES and biodiversity. Especially as an ecology-first and egalitarian approach are used as planning tools, ensuring shared-decision making which should both encapsulate that of investors, the peoples and natures interests. As is proposed by principle two, a hierarchical perspective is recognized between ecosystems, economies and human culture, where increasing natural capital ensures both healthy human

economies and cultures. The above principles thus see the restoration and protection of ecosystems and biodiversity as a way to create more sustainable communities and economies.

Hammond & the Silva Forest Foundation (2002) have furthermore proposed a process of which planning authorities can use to both conceptualize and ensure this focus on the interlinkages through spatial levels, scales and time. A point of departure is taking at the largest, sub-continental, spatial scale, then proceeding down spatial scales until individual patches of land or watersheds. However, five primary variables are employed at each scale:

- Ecological sensitivity
- Unique or special features
- Representative features
- Focal species
- Connectivity

Hammond & Silva Forest Foundation (2002:3)

The expression of these variables depend very much at which scale they are relating to. Hammond & the Silva Forest Foundation (2002) work with three spatial scales – Sub-Continental and Regional/Large Landscapes, Landscapes and Multiple Watersheds, and Ecological Communities and Patches, which are respectively called Protected Areas Network (PAN), Protected Landscape Network (PLN), and Protected Ecosystem Network (PEN). These are summarized in Table 2.2, though important to note is that, as they themselves also point out, Hammond & the Silva Forest Foundation's definition of scales is not exhaustive, and there typically exists many intermediate scales. These should therefore be seen as primary scales (ibid.).

Network	Geographical Scale	Specific components	Map scale
Protected Areas (PAN)	Sub-Continental & Regional/Large Landscapes	Core reserves and linkages that provide connectivity between core reserves, and throughout the landscape being planned Areas are inclusive of the five primary variables	1:500.000 to 1:200.000
Protected Landscape (PLN)	Landscapes & Multiple Watersheds	Old growth or late successional forests Riparian ecosystems Wetlands and wetland complexes Ecologically sensitive areas Naturally rare ecosystem types Linkages or corridors between and within ecosystems Habitats for rare, threatened, endangered genetic strains, species, and ecosystem types Ecological communities that are representative of the landscape	1:200.000 to 1:20.000
Protected Ecosystem (PEN)	Ecological Communities & Patches	Large living and dead tree structures Small ecologically sensitive areas Ephemeral streams and wetlands Linkages between structures	1:20.000 to 1:500

Table 2.2 Multiple scales for ecosystem-based planning. Adapted from Hammond & the Silva Forest Foundation (2002:4-5)

Going further, Hammond & the Silva Forest Foundation (2002) outline the major steps in the process of the actual planning as well as mapping for ecosystem-based planning. These will not be elaborated on but are seen in Box 1 with their substeps.

Steps in an Ecosystem-Based Planning Process

1) Describe the character and condition of the planning area, including:
    a. The ecological landscape, and
    b. The human communities within or dependent upon the ecological landscape
2) Identify what to leave – what parts of the landscape need to be protected – by:
    a. Determining ecological sensitivity and identifying ecological limits
    b. Identifying naturally or ecologically rare ecosystems
    c. Identifying landscape pattern and representative ecosystem types
    d. Defining a PAN, consisting of core reserves and linkages or corridors between reserves
    e. Test for habitat needs of a range of species
3) Develop diverse, ecologically sustainable community-based economies by:
    a. Defining PLN in landscapes that will be modified by ecologically responsible human use
    b. Defining PEN in patches that will be modified by ecologically responsible human use
    c. Protecting natural capital
    d. Developing a diversity of ecologically responsible activities, which focus on quality and adding value, as close to the source of resources as possible
    e. Providing for sufficiency and quality livelihoods
    f. Promoting the development of social capital

Box 1 Steps in an Ecosystem-Based planning process. Taken from Hammond & the Silva Forest Foundation (2002:5-10)

For this thesis, step 3 is seen as the most relevant, as it relates to urban planning rather than planning for the open land and in greenfield areas. It is clear that the principles and process developed by Hammond & the Silva Forest Foundation (2002) is mostly related to the latter, which is why it is relevant to delve into the concept of urban ecosystem services. The importance of ensuring large wildlife habitats, and the very fact, that if one seeks to protect and restore ecosystems it is most effective in the open land, is not lost on this thesis. Undersigned is acutely aware of this, but as has been previously mentioned, this thesis proposes that it is equally relevant to consider and plan for ES in urban environments, as it is to restore and protect larger nature reserves and wildlife habitats. This will be elucidated in the coming section.

2.2.1 Urban Ecosystem Services

When treating ES in urban planning, it is inevitable to meet the concept of urban ecosystem services (UES). It elucidates the importance of ES in regulating components of the urban environment, relating typically to carbon sequestration, climate regulation and adaptation, and the urban heat island effect (Geneletti et al., 2020). As Geneletti et al. states, the inclusion of ES in urban plans typically speaks to both its quality and the strategic considerations regarding

ensuring sustainable and resilient cities. However, UES are furthermore typified by the difficulty in creating distinctive boundaries, as ES in general are dynamic, fluctuating, and extends far beyond the geographical, political and biophysical measures manageable by a single political entity, such as the municipality (ibid.). This speaks to the complexity of planning for ES, though this should not take away from the importance of including it in urban planning. While short-terms benefits might seem far and few between, planning for UES oftentimes lead to both seen and unseen benefits, such as the aspects mentioned above. '*What Has Nature Ever Done For Us? – How Money Really Does Grow on Trees*' by Juniper & Windsor (2013) provide many concrete examples of how ES affect humanity in monetary terms. One such example is that of the Central American city of Belize, where the coastal protection from mangroves and coral reefs alone is estimated to avoid damages ranging from $231-347 million/year . In comparison, the value of the coral reefs and mangroves is estimated to $14-16 million/year, and tourism brings in about $150-196 million/year, or 15 percent of the country's GDP in 2017 (ibid). This is not to undermine the value ES has for people in a more personal sense, where positive correlations between both physical and mental health has been found in terms of a person's interaction and their homes proximity to green spaces (ibid.). Furthermore, species and habitat diversity has been found to positively influence this statistic, prompting researchers to urge planners to include ensuring the creation of habitat mosaics and ecological corridors in urban planning (ibid.).

2.3. Building a Framework

The purpose of this section is to operationalize and contextualize the concepts and theories presented in the previous sections. Concretely, this entails developing first and foremost an understanding of ecosystem-based planning in a Danish as well as an urban context. Secondly it entails providing a conceptual framework, which takes the understanding of Urban Ecosystem-Based Planning and relating it to the concepts of discourse as power and plannability. All this to provide a better understanding of the concepts and their interlinkages in the data collection, but most importantly the analysis. Section 2.3.1 elucidates the former, while section 2.3.2 provides the conceptual framework. Furthermore, in the formerly mentioned section, a framework will be provided for the understanding of Urban Ecosystem-Based Planning.

2.3.1 Understanding of Ecosystem-Based Planning

Throughout this paper, the term ecosystems-based planning has been frequently used, as is only adaquate when it lends its name to this thesis. Hoewever, even though this chapter has explored its origin and the principles and process, it has been found necessary to further elucidate and delimit the term. This is just as much as to secure clear communication in the usage of the word, to adapt it to a Danish context, and put it into the framework of urban ecosystem services. The latter as the framework provided by Hammond & the Silva Forest Foundation (2002) is much more focused of the mapping and planning of ecosystems in the open land. However, an urban

approach to ecosystem-based planning has already been employed in the regeneration of the Toronto Waterfront as described by Laidley (2017), which adds to the basis of the coming understanding and framework for urban ecosystem-based planning. Step 3 as seen in Box 1 is seen as the most relevant to urban planning and will thus also inspire the understanding. The understanding of ecosystems services as has been presented in section 2.1 will be used and adding to this, the very nature of the concept is expanded with the considerations of UES as presented in section 2.2.1. The understanding of urban ecosystem-based planning can be seen as per Box 2.

Understanding of an Urban Ecosystem-Based Planning Approach

Urban ecosystem-based planning is a systemic approach to urban planning and planning for the open land, which stresses the necessity of seeing planning projects in a holistic perspective. This entails seeing urban planning through the lens of which impacts it has on its immediate surroundings, its relation to the place, local, city, municipal, regional, national and international contexts. Urban planners must therefore always consider how their projects affect the glocal climate and environment, including but not exclusive to biodiversity. This entails including considerations of how to mitigate or produce the least possible GHG-emissions in a life-cycle perspective, the possible interlinkages it could have to larger green and blue structures in a network, and contribution to creating, restoring and maintaining habitats for relevant species.

Furthermore, urban ecosystem-based planning must encourage co-creation, collective and green solutions, an integrated participation process to ensure local legitimacy and roots in the community, while also ensuring a representative and broad involvement of citizens where possible. The planning must therefore also ensure equitable access to what is being planned for. This approach is therefore focused on both the planning process, its realization as well as its subsequent usage. In this way, it operates, as has been previously mentioned, on several scales and their internal interactions. An urban ecosystem-based planning approach acknowledges the hierarchy of ecosystems being necessary to shape human culture which in turn shapes and effects the economy. Putting ecosystems first entails involved actors relevant to the planning project all participate actively in making the different aspects of the project as environmentally sustainable as possible. Table 2.3 on the next page provides a framework for the above.

Urban Ecosystem-Based Planning

Planning	Realization	Usage
Broad, equitable and active actor involvement	Environmentally sustainable and certified resource usage *(e.g. FSC, DGNB)*	Promoting co-creation and green collective solutions
Relation and connection to ecosystems at the place, immediate, local, municipal, regional, and national scales	Focus on upcycling and recycling	Provision of energy from renewable sources
Impact assessment on the above, and steps to mitigate these	Seeking least possible *(preferring neutral)* GHG-emissions	Promoting ecologically sustainable urban communities
Preferring regeneration of brownfield areas rather than building in greenfield areas	Restoring, protecting, and creating habitats *(urban habitat mosaics)*	Ensuring access to green modes of mobility

Table 2.3 Framework for an Urban Ecosystem-Based Planning approach.

Box 2 Understanding of Urban Ecosystem-Based Planning

2.3.2 Conceptual Framework

The conceptual framework appears as seen in Figure 2.2, and details how the concepts and theories as described in the previous sections interface. It must of course not go unmentioned, that it is a very crude representation of reality, but it is nonetheless a way to visualize the thought process utilized in the writing of the present thesis.

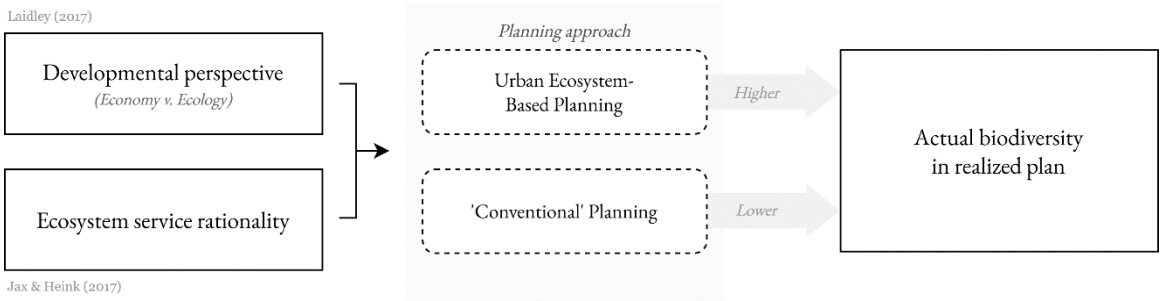


Figure 2.2 Conceptual Framework

In the figure a relationship is considered between the choice of developmental perspective and that of the ES rationality. Here, the developmental perspective denotates which concrete goals one has with the urban development, annotated by the *economy v. ecology* in the brackets below. This is not to say that one must choose either or, but rather that an inherent and collective

decision must be made between actors involved in the making of plans, of what is most important.

Developmental Perspective

As indicated in Box 2, the developmental perspective would constitute the planning phase, where a conscious effort must be made towards ensuring ecological concerns, as well as ensuring a thorough analysis of impacts on all possible scales. The developmental perspective therefore constitutes both private and public actors' interests in urban development. Laidley (2017) is cited above this box, because of the term 'Urban Entrepreneurialism', which plays a central role in most new urban planning. The term encapsulates the reinvention of urban areas through conscious planning efforts. In other words, a developmental perspective. Contained within the concept is that of reinventing, relaunching and restoring urban areas to make them more attractive for possible future residents coming from both inside and outside the city. Through urban development, the perspective – and goal – is therefore to create urban areas, that can entice new and keep old citizens in the city. Specifically, the developmental perspective inherently has, as previously mentioned, a discussion on economy versus ecology. While this perspective inherently involves a discussion on economy versus ecology, a deeper exploration of this debate is reserved for the discussion chapter.

Ecosystem Service Rationality

The ES rationality, drawn from Jax & Heink (2015), has been described thoroughly in section 0, and will therefore not be elucidated further here. However, in the context of the relationship with the development perspective, the interfacing is primarily seen through which rationalities are apparent in the political and public debate, the external communication, as well as the policy documents produced as a result of the former. In short, while the developmental perspective deals with the goals and intentions of planning, the ES rationality deals with discourse and narratives used when communicating the planning product. Both aspects are seen as instrumental when determining the planning approach.

Planning Approach

The planning approach, while crude as it only details two, one as proposed in this thesis and the other 'conventional' planning, must be seen from the perspective of a business-as-usual scenario. Municipalities in Denmark must all follow the Danish Planning Act, which details the scales of planning and what they each respectively must contain (Planloven, 2020). When using the word 'conventional' in terms of a planning approach, it should therefore be relegated to that of what is statutory, i.e. municipal plans, local plans, and planning strategies. The urban ecosystems-based planning approach, as per Table 2.3, must also therefore be seen in this same perspective. It takes its point of departure in a like scenario, where an urban ecosystems-based planning is institutionalised, through which could be the Danish Planning Act.

Shifting the focus to the arrows pointing out from each approach, it is suspected that with the use of an urban ecosystems-based planning approach, one then sees more actual biodiversity in

the realized plans. 'Actual biodiversity' is consciously used, as biodiversity, in terms of this thesis, refers to spaces for habitats and networks created in the city. A lawn speckled with a few trees, while creating possible habitats for ground- and tree-dwelling species, are therefore not seen as 'appropriate' biodiversity measures in this approach.

Measuring 'Actual Biodiversity'

There already exists a method of measuring biodiversity, which has also been adopted into the Danish Planning Act, called 'Bioscore' (Ejrnæs et al., 2018). The Bioscore was invented to aid in assessing biodiversity through GIS visualizations, which then could help qualify planning when creating the so-called 'Green Map of Denmark' (ibid.). These maps are statutory, and their purpose is to create networks of habitats and ecological corridors, to increase species biodiversity. A Bioscore is composed of a weighted sum of species that appear in the area that are also on the IUCN's red list of threatened species (IUCN, n.d.), and a proxyscore of the areas ability to support these species in a 10x10m map grid (Ejrnæs et al., 2018). An example of this can be seen in Figure 2.3. However, while the Bioscore is a useful non-biased tool to visualise biodiversity, the Green Map of Denmark mostly concerns itself with creating networks and habitats in the open land, rather than also involving urban environments as an important player in increasing and/or restoring biodiversity. As can be seen from the figure, a substantial amount of moderate to high bioscore areas can be found as wedges entering the city from the west and south.

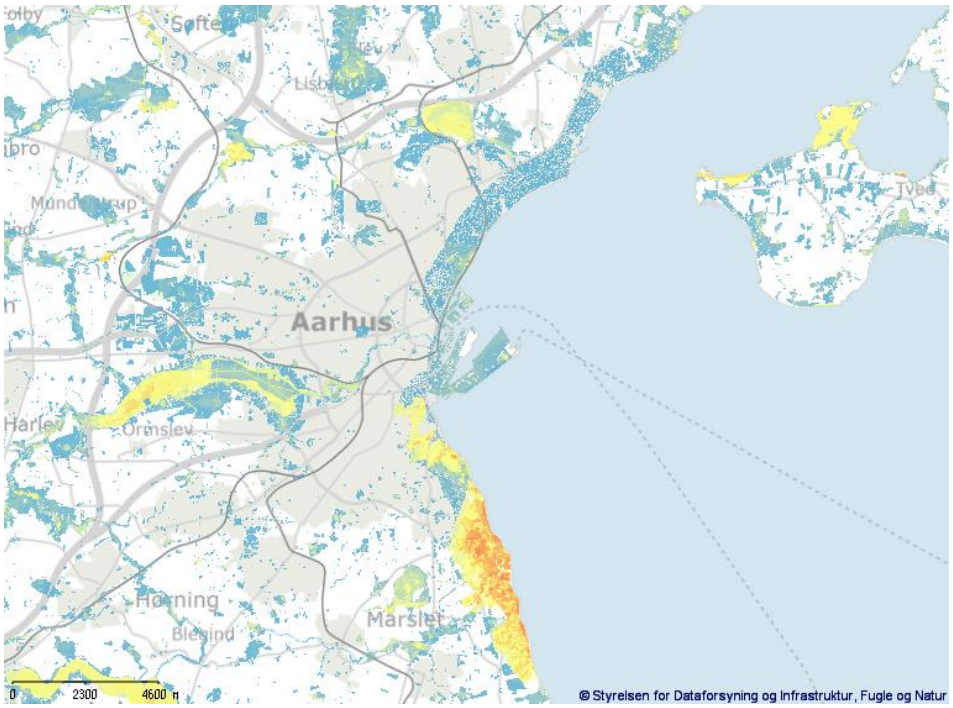


Figure 2.3 The Bioscore in the city of Aarhus as of 2021 from Miljøministeriet (n.d.).
Light blue = 1, yellow = 10, red = 20. Higher is better.

2.4. Summary

This chapter aimed to answer sub-research question 1: What role does the application of ES and an ecosystem-based approach play in ensuring sustainable development and quality of life in urban areas?

By exploring and elucidating the concept of ES, the different perspectives inherent in related discussions, and the rationalities inferred from these perspectives, a greater understanding of ES and its role in sustainable development has been achieved. Concretely, ES are foundational in ensuring human survival by providing both physical and non-physical goods, as well as seen and unseen services that ecosystems offer regardless of human activity. Furthermore, the human ability to selectively prioritize ES based on explicit benefits, such as economic gains, has been firmly established. Jax & Heink's (2015) typology of rationalities—didactic, instrumental, and resource protectionist—are fundamental concepts in analysing policy discourse.

Additionally, the ecosystem-based approach by Hammond & the Silva Forest Foundation (2002) has been described and explored in depth, primarily utilizing their principles in the proposed urban ecosystems-based planning approach (Box 2). Before this, the concept of UES was presented and described to further qualify the relevance of systematically including ES and biodiversity in urban development strategies and plans. This highlights the monetary and non-monetary benefits ES provide for human quality of life in urban areas and ensures sustainable development through green measures in climate proofing.

Lastly, a conceptual framework is presented, visualizing the interfaces and linkages between the different concepts introduced in the literature review. This framework sheds light on how an urban ecosystems-based planning approach could potentially ensure higher species biodiversity in urban areas. One way to quantify this is through the Bioscore, as described by Ejrnæs et al. (2018).

In the coming chapter, the methodology used in this dissertation, including the philosophy of science, mode of inference, methods used, research design, and a presentation of the case will be elucidated.

Chapter 3. Methodology

The methodology chapter serves as a roadmap for understanding how the research was undertaken and the processes involved in gathering and analyzing data to address the research questions. This chapter outlines the overall research approach, including the philosophy of science guiding the study, the research design employed, and the specific methods utilized for data collection and analysis. All this is done to ensure transparency into the research process, as well as to enhance the credibility and rigor of the study's findings.

First and foremost, the methodology starts by discussing the overarching philosophy of science that informs the research approach, highlighting key epistemological and ontological considerations. Subsequently, the research design is elucidated, detailing the plan and strategy for conducting the study. Following this, the chapter delves into the specific research methods employed, offering insight into how data was collected, analysed, and interpreted to address the research questions. Finally, an analytical framework is proposed to aid the structuration of the analysis.

3.1. Critical Realism

Critical realism, as articulated by emeritus professor in Urban Planning Petter Næss (2015), presents a compelling theoretical lens for understanding the dynamics of urban development. By emphasizing the interplay between structure and agency, critical realism offers valuable insights into the ways urban spatial structures shape individuals' actions and how, in turn, individuals can exert influence on these structures. This perspective challenges traditional deterministic views of urban development, highlighting the potential for intentional intervention and change. Næss identifies four central intersections between critical realism and urban planning, which are pivotal for guiding research and practice in the field.

1) Recognizing the influence of urban spatial structures on individuals acknowledges the role of built environments in shaping behaviours, preferences, and opportunities.
2) Acknowledging the potential for influence underscores the agency of planners, policymakers, and residents in shaping and reshaping urban landscapes, opening possibilities for transformative interventions toward equitable, sustainable, and livable cities.

3) Critical realism enables the assessment of alternative spatial solutions by evaluating the likely impacts of planning interventions. By considering underlying mechanisms and structures, planners anticipate consequences and identify strategies aligning with desired outcomes.
4) Critical realism stresses integrating knowledge from diverse fields in urban planning, essential for addressing cities' multifaceted challenges. Drawing insights from ecology, sociology, economics, and geography, planners develop holistic strategies for shaping urban futures.

Næss (2015) also underscores the significance of scale awareness in urban planning, particularly in the context of sustainability. This entails recognizing the interconnectedness of local, regional, and global scales and understanding how interventions at one scale may have ripple effects across others. For instance, debates between proponents of green and compact city models highlight the importance of considering both internal urban systems and their external impacts on surrounding environments. Critical realism encourages the integration of multiple perspectives and methodologies to address these complex scalar dynamics and promote more balanced and resilient urban development.

At its core, critical realism posits a nuanced understanding of reality, distinguishing between the ontological realm of underlying structures and mechanisms (the “real”), an “actual” level, which consists of events and non-events generated by structures and mechanisms on the “real” level, and the empirical realm of observable phenomena and experiences (Egholm, 2014). This framework acknowledges the existence of enduring properties and causal mechanisms that operate independently of human perception, shaping the dynamics of urban systems. By uncovering these underlying mechanisms and structures, planners can gain deeper insights into the root causes of urban problems and develop more effective strategies for addressing them. However, critical realism posits that there is not a causal relationship between the real and actual level. It is multi-casual and contextual, which can be described and explained, and can thus not be used to predict future events and phenomena (Egholm, 2014).

3.1.1 Mode of Inference

Within critical realism, retroduction is the mode of inference which entails working backwards from observed phenomena to infer the underlying causal mechanisms that produce them (Egholm, 2014). Unlike deduction, which starts with general principles and derives specific conclusions, or induction, which starts with specific observations and generalizes to broader principles (ibid.). In essence, retroduction involves reasoning from effects to causes, seeking to identify the underlying structures and mechanisms that are responsible for producing the observed outcomes. It aims to uncover the "hidden" or unobservable aspects of reality that generate the observable phenomena we encounter. Within critical realism, retroduction is seen as a key methodological tool for exploring the depth of social reality beyond what is immediately observable. By engaging in retroduction, researchers can move beyond mere description of

phenomena to uncover the underlying generative mechanisms that shape those phenomena. This allows for a deeper understanding of the social world and enables researchers to formulate more robust theories and explanations.

Relevance

Critical realism offers a robust and nuanced framework for examining the relationship between urban structures and individual agency. In terms of this thesis, which entails acknowledging the complexity of urban development and the explicit need to incorporate diverse perspectives and methodologies to navigate this. The term 'wicked problems' thus becomes central when adopting this philosophy of science, as problems related to urban development are seen as multifaceted and interconnected. Holistic solutions are therefore needed to 'solve' these wicked problems. When treating the subject matter of an urban ecosystem-based planning approach, as proposed in Section 2.3.1 on page 14, it inherently requires an understanding of the underlying structures and mechanisms that shape urban space, as well as individuals and institutions agency to change these.

Retroduction as a mode of inference has been found relevant in terms of writing this article, as it puts weight on working backwards from observable phenomena. This is to identify casual mechanisms and structures, and thereby also a way to change these. It inherently acknowledges the complexity of the structures and mechanisms which shape physical space. Through working backwards from existing urban planning documents and strategies, as well as statements from decision-makers and actors, it is purported that an answer to the main research question can be found. In other words, identify a possible explanation to how an increase in natures plannability possibly could align with the adoption of urban ecosystems-based approach.

3.2. Research Design

In Table 3.1 the research design showing the sub-research questions – as also introduced in the introduction – the data required and the proposed data generation methods have been visualized. Sub-research questions 1 has been treated in the previous section through a literature review. Relevant literature was found primarily through the University of Aalborg's own library portal aub.aau.dk/, by using pre-defined keywords and later scouring the abstracts, introductions and conclusions to deem if the found literature would be beneficial in the writing of the dissertation. Some of these keywords are:

> Urban ecosystem services, urban ecosystems, ecosystem services, ecosystems-based planning, regeneration, biodiversity, biodiversity discourse, ecosystem service discourse...

The result are the sources found in use in the literature review. Additional sources have also been found through examining previous semester projects bibliographies.

Sub-research question 2 constitutes the analysis and revolves around utilizing the understanding presented in Box 2. However, concrete keywords need to be identified, which is done in section 3.4.2. In the same context, the identification of relevant planning documents and strategies are required, to do the document analysis. This identification is likewise done in section 3.4.2.

Furthermore, interviews to both qualify and deepen the understanding of the subject is necessary. It will also work to supplement the document analysis, and might provide previously unseen avenues to explore. Who has been interviewed, the method of the interview and how it subsequently has been treated are elucidated in Section 3.4.1. Furthermore, concrete instances of planning, that could imply the systemization of an urban ecosystems-based planning approach is needed.

Sub-research question 3 constitutes the discussion and serves to bring the subject matter of this dissertation and the treated case into a birds-eye view. Here, perspectives and considerations as well as possible critique regarding the urban ecosystems-based planning approach and its inherent conceptualizations will be treated. The discussion topics presented in tandem with Figure 2.2 Conceptual Framework will be treated here.

How can the enhancement of nature's plannability in urban environments align with the integration of an ecosystem-based planning approach into Danish planning praxis?

	Sub RQ	**Data required**	**Data generation methods**
1	What role does the application of ecosystem services and an ecosystem-based approach play in ensuring sustainable development and quality of life in urban areas?	Knowledge on what ecosystem services and what an ecosystems-based approach entails Knowledge on what urban ecosystem services constitutes in terms of sustainability	Literature review
2	In what ways does the municipality of Aarhus incorporate an urban ecosystems-based planning approach into their urban planning strategies?	Understanding and keywords to identify what an urban ecosystems-based planning entails Knowledge from actors involved in the case and concrete planning instances Planning documents and strategies	Interviews, document analysis
3	Which shortcomings could an urban ecosystems-based planning approach have?	Perspectives from other planning involving ecosystems	Discussion

Table 3.1 Research design

Answering the sub-research questions should then assist in identifying an answer for the main research question. This will be, as is customary, presented in the conclusion in Chapter 6.

3.3. Choice of Case

The municipality of Aarhus has been chosen as the case of this report, specifically focusing on specific planning and projects in the city of Aarhus. This choice has been partially done because of the undersigned previously having worked with the case of Aarhus Ø, as will be explored in section 3.5, but also because the municipality of Aarhus themselves have chosen to work in a systems-perspective in regards to their urban and generally physical planning, as can be seen in their planning strategy from 2023 (Aarhus Kommune, 2024a). This is only made more explicit and relevant considering the name of the planning strategy – Planning Strategy 2023: Networks and Intimacy[2]. Specifically perpetuating a perspective of having both a place, local, regional and national focus when planning for nature and 'blue-green structures' is of great interest for this thesis. Though not explicitly stating that they are working with an ecosystems-based planning approach *an sich*, much of the planning strategy seems to point towards this. More on this in Chapter 4. section 4.2.3.

As this is a single case study concerns regarding the generalizability must of course be considered. Here, the understanding of Flyvbjerg (2006) regarding single case studies is applied. That is, while single cases cannot in of themselves lead to formal generalization, they can contribute to the general knowledgebase as a *force of example* – in other words, amongst white swans identify black swans to further qualify theory and provide empirical knowledge. Considering the context of this thesis, where it has previously been made explicit that not much if any literature or research exists on this area, the findings will contribute to identifying tendencies in the approach of one municipality. A broader analysis trying to identify whether the municipality of Aarhus is a black swan amongst whites would therefore be relevant. However, considering the timeframe and resources available in the writing of this dissertation, this was not deemed realistic. The municipality of Aarhus must therefore be seen as a point of departure that can hopefully contribute to broader research, uncovering the systemization of ES and biodiversity in Danish urban planning.

3.4. Research Methods

In the next sections the research methods as first presented in Table 3.1 will be elucidated. Stuart Farthing's (2016) book *Research Design in Urban Planning: A Student's Guide* has been instrumental in writing this section, as it excels in identifying and relating central methods to urban planning research. Farthing will thus, unsurprisingly, feature in many of the citations in the next sections. Additional literature has been found to corroborate Farthing where it is found relevant.

[2] Authors translation. Original titel *Planstrategi 2023: Netværk og Nærvær*

3.4.1 Interview

An interview is a method involving a purposeful and structured conversation, distinct from casual everyday interactions (Brinkmann & Kvale, 2018). It entails questioning and attentive listening to gather data and insights into the interviewee's life experiences and knowledge, serving the research's aims of understanding their perspective (ibid.). Interviews play a central role in urban planning research, providing a qualitative means to grasp various aspects of a subject by assuming the expertise of the interviewee (Farthing, 2016). However, considerations must be made preceding the interview, which are primarily relegated to the depth of the interview, and how structured it is (ibid.). For the sake of brevity, all of the interviews conducted or used as a part of writing this thesis have been semi-structured. Special notes and how they individually are treated will appear in the respective paragraph describing the interview.

As is explicitly reflected on in section 3.5, data collected in relation to previous projects the undersigned has participated in writing, and thus also interviews, have been found advantageous for the use of writing this thesis. This is primarily done from the perspective of having similar cases, and the questions asked in the interviews, and data derived therefrom, would not differ significantly. Additional considerations and reflections regarding the use of data from a previous project can be seen in previously mentioned section 3.5. Furthermore, to both corroborate and ensure that data used in this thesis is relevant, an additional interview has been conducted, which will be described in the following.

Interview with chief officer of city strategy at the municipality of Aarhus Bente Lykke Sørensen

An interview was conducted on April 25th 2024 with the chief officer of city strategy at the town hall of the municipality of Aarhus. Before the interview, and interview guide containing three themes were formulated to lead the interview. These themes were 'Planning strategy 2023', 'Green City Development', and 'Aarhus Ø', under which each containing questions specifically relating to their respective theme. While the themes were sent to the interviewee beforehand, the questions were not. This was done as sending the questions was deemed irrelevant, pertaining to wanting a more explorative conversation with the interviewee.

The initial thematization before the interview is also used for the summary of the interview, which can be seen in Appendix A, which also contains the interview guide with concrete time and place. During the interview, a Samsung Galaxy Flip 4 was used to record the interviewer and the interviewee in dictaphone mode. This was done to ensure correct citation and further processing of the interview. Proceeding the completion of the interview, the audio-file underwent an initial transcription process utilizing Whisper AI using the platform Google Platform, after which a rigorous review proceeded as to correct mistakes and attribute speaker diarization. The transcript is considered internal and merely used to assist the writing of the thesis for the reasons previously stated and is therefore not included. When citing from this interview, the following citation will be used - (Sørensen, 2024a).

3.4.2 Document Analysis

A central method utilized in the writing of this dissertation is that of document analysis. Documents are central for urban planning research, as they encompass both strategies, concrete planning documents, maps etc. (Farthing, 2016). They produce knowledge about the social world, and can also contribute in shaping it (ibid.). As has already been introduced in the literature review especially regarding the strategic perspectives in the usage of ES and biodiversity in policy discourse (section 2.1), the narratives inherent in policy documents, plans, strategies etc. contribute to both shape the social and physical world. If a politician or policy-makers understanding of ES and biodiversity is didactic, then one might see more nature protection, restoration and regeneration. Adversely, if it is resource protectionist, a bigger focus might be put on protecting units of production by advocating for measures maintaining aforementioned (Jax & Heink, 2015). Utilizing policy and planning documents is therefore also instrumental in the creation of this dissertation, as the analysis of these documents might uncover the rationalities behind them, and therefore also which focus is put forth in the development.

For the purposes of this thesis, a collection of plans and strategies from the municipality of Aarhus has been chosen, which can be seen as per the list below. Furthermore, a short description detailing their relevance for this thesis is provided:

- A Greener Aarhus with more Blue: Addendum nr. 105 for the 2017 Municipal Plan (Aarhus Kommune, 2022)

  An addendum to the municipality of Aarhus '2017 Municipal Plan', which is a statutory document regulated by the Danish Planning Act (Planloven, 2020). This addendum put the inclusion of nature and biodiversity in the urban development of the city of Aarhus, ensuring ecological networks and considerations regarding ecosystems in planning, as well as smart solutions for climate adaptation in terms of especially rainwater drainage, at the forefront. Furthermore, it maps specific geographic areas of interests for future green development.
- A Greener Aarhus: City of Aarhus' Policy on Nature and Green Surroundings (Aarhus Kommune, 2023a)

  'A Greener Aarhus' replaces and consolidates former policies and strategies into one concrete policy document (Aarhus Kommune, 2023c). It expands upon the goals in the addendum and points out four focus areas; 1) Nature in the open country, 2) The green elements in the city, 3) Experiences and says in nature and green surroundings, and 4) Co-creation on green projects. Furthermore, it is a dynamic document which must be revised every city council period, and the city council will be presented with a status every year.
- Planning Strategy 2023: Networks and Intimacy (Aarhus Kommune, 2024a)

  Also a statutory document, which likewise is regulated by the Danish Planning Act (Planloven, 2020). Details how far the goals of the municipal plan are, and elucidates areas that need to be revised. Also provides a description of how the municipality intends to reach the municipal plans goals and put forth additional development goals as well as their respective strategies. Reinforces and further describes the policy focus put forth in the previous documents.

In order to analyse the above documents, keywords and -phrases are needed, as to identify the extent to which a systemic approach through an urban ecosystems-based planning approach is already apparent. These can be seen in Table 3.2. As two out of the three documents are in Danish, the English keywords and -phrases are presented followed by the Danish equivalent.

Keywords and -phrases

English	*Danish*
Ecosystem(s)	Økosystem(er)
Ecological corridors	Økologiske korridorer
City nature	Bynatur
Green urban spaces	Grønne byrum
Climate adaptation	Klimatilpasning
Biodiversity	Biodiversitet
Wicked problems	Wicked problems (vilde problemer)
Spatial scales	Spatiale skale
Green networks	Grønne forbindelser
Sustainable(-ility)	Bæredygtigt
Holistic	Holistisk/Helhedsorienteret

Table 3.2 Keywords and -phrases used for the document analysis.

The keywords- and phrases seen in Table 3.2 should not be seen as exhaustive. Rather, it is a point of departure in the analysis of the chosen documents. All of the words and phrases are considered in the context they appear in the document. The words will not be tallied but will however be used in a qualitative assessment. They are therefore utilized in such a way that the document analysis takes the form of a content analysis, identifying underlying themes.

3.5. Reflection on Sources of Data

For the writing of this thesis, it has been found advantageous to use data from a previous semester project on the Urban Planning & Management program at Aalborg University, which the undersigned has been a part of. The reason for this is primarily that the project has a similar focus on ecosystem services and their integration into Danish planning praxis. As is good academic and ethical praxis when writing, this section will therefore serve to provide transparency when dealing with data from this source. Concretely, the project is from the first semester of the masters, titled as is seen on Figure 3.1.

To assist the writing of this thesis, data and inspiration from the project will be used, which will be explicitly declared when this is the case. Using these, I, the undersigned, is acutely aware that they take the form of *secondary* sources, which, in short, are sources, that interpret, explain, critique, or analyse *primary* sources (University of Michigan-Flint, 2024). Primary sources thus constitute original documents of an event or discovery and are typified by their high credibility (ibid.). Examples include eye-witness testimonies, diaries and letters, meeting notes, minutes from political negotiations etc. Much research is established on the ground of secondary sources, where the literature review often encompasses the bulk of it, as to assert gaps in literature or to otherwise shed light upon a problem and clarify its relevance. Important pitfalls to avoid, especially when reusing or -interpreting data from these sources, include, but are not limited to, the framework of which the data is produced. While this thesis touches on the same topics researched in the project, it does not however have the same focus nor problem definitions. As a direct consequence of this, the data of the projects are generated from another frame of reference, and this data would most likely be different if redone in the context of this thesis.

Figure 3.1 Frontpage from the first semester project (Bøgholm Frederiksen et al., 2023).

Short Summary of the Semester Project

'Urban Ecoystem Services in Waterfront Regeneration: Planning Principles for a Sustainable Development on Pier 3' is a project conducted in relation to the first semester of the master's in urban planning & development at Aalborg University in the autumn semester of 2022 (Frederiksen et al., 2023). The focus of the project was relegated to uncovering how urban ecosystem services could have a higher priority in the planning and regeneration of Pier 3 on Aarhus Ø, as the planning for the pier at the time was just beginning (ibid.). Using interviews with both actors working at the municipality and citizens living on Pier 4 on Aarhus Ø, it was uncovered that ES historically had been deprioritized in the general urban development, which explains why much of the areas on Aarhus Ø are constituted by grey infrastructure. However, utilizing the same interviews and proposals from citizens of the joint council of Aarhus Ø, a proposal of how wishes for more green, ensuring a focus on ecosystem services, and meeting both developer and municipal demands for more housing was made. The planning principles were 1) to utilize an ecosystems approach inspired by Toronto, 2) to use an integrated planning approach for the stakeholder participation, and 3) ensuring an equity of distribution in the supply of ecosystem services, as well as exposing the benefits of urban ecosystem services through more information.

3.5.1 Reflection on Case area

While the case area in the above treated semester project is that of Aarhus Ø exclusively, this project seeks to expand out into both the city of Aarhus, as well as the municipality of Aarhus. As has already been established in the section on document analysis, the chosen documents are not limited to a specific area but focus on the larger municipality of Aarhus. Especially the relation and interaction of the open country and the city is of interest to this dissertation. The data and experiences used from the aforementioned semester project will therefore also be relegated to that which deals with the municipality of Aarhus and the initiatives that might indicate a more systematic inclusion of ecosystem services in planning praxis. However, Aarhus Ø as an area is still very relevant in this context, as both the past, present and future planning all can help in identifying the chosen focus areas of the municipality. This could then help inform the larger focus points in the municipality. Here, a thought is primarily given to the approach which dominates the newer planning on Pier 4 and inner Aarhus Ø, which follows the principle of 'People before places before buildings'. In the interview with Bente Lykke Sørensen, this principle was a huge point of pride, as it has recently won a prize at a city planning congress (Sørensen, 2024a). More on this in the analysis.

3.6. Analytical Framework

To assist in the writing of the analysis, an analytical framework is proposed, which can be seen in Figure 3.3. As it appears in the figure, there will be two parts of the analysis treating first the ambitions and focus areas of selected policy and planning documents. Secondly concrete planning instances will be identified and used to assess the impacts of the policy and planning documents. This is to tie both the theoretical and practical dimensions, and to provide real-world examples that are consistent with the understanding of an urban ecosystems-based planning approach.

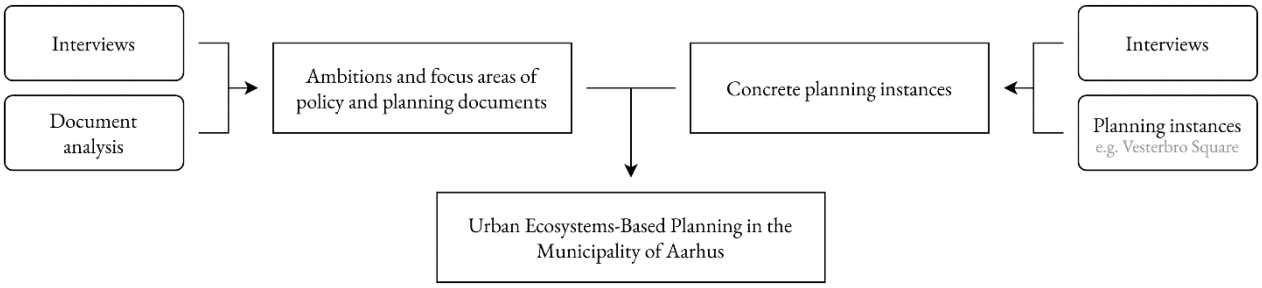


Figure 3.3 Analytical framework

The documents selected have already been presented and described in short in section 3.4.2, so these will not be elucidated further in this section. However, the intended planning instances have not. It is assessed that a description of these instances is more appropriate as they appear in the analysis, so they will only be mentioned by name here. Concretely these instances revolves around the projects of Vesterbro Square (Aarhus Kommune, 2023b), Frederiks Avenue (Aarhus Kommune, 2024b), and Aarhus Ø (Frederiksen et al., 2023; Sørensen, 2024a). The two former being proposed as a part of making the city of Aarhus greener, more liveable and walkable, and the latter being one of the biggest and ongoing urban development projects in Aarhus the past 20 years. The next two sections will function to further uncover the relevance and describe the intended content of 'Ambitions and Focus Areas' and 'Concrete Planning Instances'.

Ambitions and Focus Areas

The intention behind focusing on this aspect is to uncover first and foremost the ambitions behind the strategies of 'A Greener Aarhus with more Blue', 'A Greener Aarhus: City of Aarhus' Policy on Nature and Green Surroundings', and 'Planning Strategy 2023: Networks and Intimacy'. This through the usage of the interview with Bente Lykke Sørensen conducted in this project, an interview found between Green Cities Europe and city architect of Aarhus Anne Mette Boye concerning the formerly mentioned addendum to the municipal plan (Green Cities Europe, 2022), and document analysis. To lead this section, an empirical question is proposed:

> What are the intentions and ambitions behind the strategies, plans, and policy documents for the municipality of Aarhus, when focusing on nature and biodiversity?

Shifting attention to the part concerning focus areas, this is specifically referring to identifying concrete initiatives the municipality of Aarhus wishes to implement in order to realize their strategies, plans, and policy. Another empirical question can be proposed for this part:

> Through which measures, initiatives and focus areas does the municipality of Aarhus wish to implement their strategies, plans, and policy?

Through this, the ambitions and focus areas of the strategies, plans, and policy documents should be thoroughly examined and elucidated. Specifically concerning the former part focusing on focus areas, a broader perspective is put on the measures, initiatives and focus areas. Using this, concrete planning initiatives are uncovered, some of which are chosen and treated in the part aptly of the same name.

Concrete Planning Initiatives

As has been previously stated, three concrete planning initiatives are chosen, which, to reiterate, are the closing and greening of Vesterbro Square, the closing of Frederiks Avenue to merge 'Musikhusparken' and 'Rådhusparken', and the urban development and regeneration of Aarhus Ø. While the two former entail the closing of arterial roads, in order to create green and liveable spaces, the latter is an example of a long ongoing urban development project, which has undergone many changes planning wise and especially in relation to the inclusion of considerations regarding ES and biodiversity. A change of ES rationalities might be apt to mention here. A common denominator for alle of the initiatives is though, that all are in varying degrees controversial planning proposals, which change the very function and appearance of the city of Aarhus. Just to put it into context, alle of the initiatives chosen are mentioned in a citizen's proposal with 1512 backers achieved in a month out of 1500 required with an expiry date of November 26th 2024, advocating for a complete stop of all road closures in the city of Aarhus, proposed by Poulsen (2024). This makes them explicitly interesting as examples of the wicked nature of urban planning problems. Furthermore, in the context of this dissertation, also very much interesting as examples of the problems an urban ecosystems-based approach face. It must however be stated, that there of course is an understanding of bigger urban development projects meeting varying degrees of backlash from citizens, which has been extensively researched by others. But when it comes to the greening of cities or road closures for better liveability, citizens resistance always seems more apparent and oftentimes leading to prolonging of complete abandonment of plans. More on this in the discussion. Following the above, another empirical question can be proposed:

> In the case of Vesterbro Square, Frederiks Avenue, and Aarhus Ø, how are the ambitions and focus areas of the strategies, plans, and policy documents concretized?

On the next page in Figure 3.4, an expanded form of the analytical framework can be seen with the inclusion of the questions proposed in the former sections.

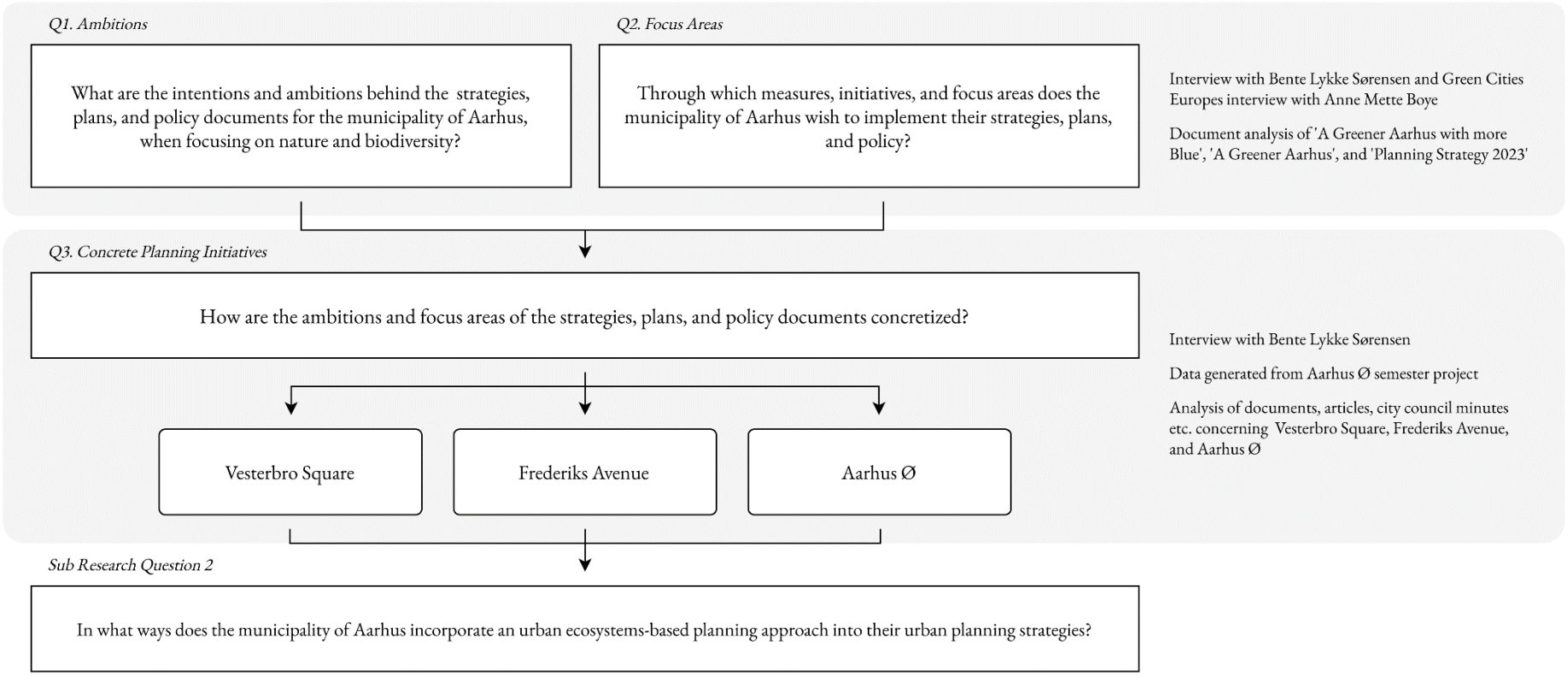


Figure 3.4 Expanded analytical framework

Chapter 4. Analysis

The analysis will follow the structure as proposed in the analytical framework in Figure 3.4. However, it has been found beneficial to first elucidate the planning history of Aarhus, focusing on its urban development. This is to gain a deeper understanding of the structures that has shaped the city of Aarhus today, and how they are informing contemporary policymaking and planning decisions. Furthermore, it is to gain an understanding of the geography of the city of Aarhus and its relation to the rest of the municipality and country of Denmark.

Following the above, the ambitions and focus areas of the chosen strategies, plans, and policy documents will be elucidated in section 4.2, as further described in section 3.6. Afterwards, the chosen concrete planning initiatives are described and analysed in section 4.3. Section 4.4 will thus provide a summary of the results of the analysis, and relate it to sub-research question 2, as seen and described in section 3.2.

4.1. Planning History of Aarhus

The city of Aarhus can trace its roots back to around the 900s, where wooden and pit houses had been built at the northern side of the river of Aarhus (Degn, 2024). In the year of 948 it became an episcopal residence, which became permanent around 1065 (ibid.). As can be seen on Figure 4.1, the city of Aarhus has historically had an attractive position as a place of trade, especially shipping by way of boats (ibid.). Thusly the borough was granted a charter in the early middle ages, and in the first half of the 1600-hundreds, it had the biggest trade fleet in Denmark after Copenhagen and Malmø (ibid.). Following a rough patch with the wars in the 1600s and later the Revolutionary and Napoleonic wars, the city of Aarhus once again prospered from the 1830s and onwards, eventually becoming the biggest city in Jutland and the second biggest city in all of Denmark (ibid.). Especially the industrial revolution gave way to massive population booms, with the foundation of a railyard for both goods and passenger transportation alike, as well as an expansion of the harbour of Aarhus to accommodate bigger freight ships for both im- and export (Christensen & Linaa, 2019).

Figure 4.1 Overview map of Aarhus. GeoData used from SDFI (2024)

In the early 1900s the city achieved the status of being Jutland's economical centre, with both the good railway, waterway and roadway connections being some of its strongest points for this development, not discounting the importance of entrepreneurial spirits affecting the city's leadership (Christensen & Linaa, 2019). This development is marked by previously mentioned massive population boom, where in the years between 1855 and 1921 an increase from 8.891 to 86.197 people can be seen (ibid.). Massive urban expansions thus also characterize this period, with both schools, churches and housing alike experiencing substantial increases (ibid.). The industrial harbour too needed expansion, to accommodate larger ships, so as can be seen in the middle on the map in Figure 4.1., huge harbours were build out into the ocean, allowing for an expansion of trade relations (ibid.). The southernmost harbour is the newest expansion, which made the formerly named 'Nordhavnen' obsolete, and instead allocated for urban development – now called Aarhus Ø (Frederiksen et al., 2023).

Economical interests have not solely dominated the development and planning of Aarhus, but in a huge part also cultural and partisan interests, oftentimes intertwining (Christensen & Linaa, 2019). Cultural events, newspapers, galleries etc. were typically organized and established in a partnership between partisan organizations and workers associations, but also with a broad involvement of entrepreneurs (ibid.). Additionally, policy and planning typically had a broad anchoring between political parties, ensuring a stable development of the city (ibid.). The

approach to planning and development of both the city of Aarhus is typified by an approach which seeks to create a collaborative effort towards urban development, ensuring both broad involvement of citizens, stakeholders, and political anchoring (ibid.). Ambitious projects have thus thrived throughout the city's history, such as that of the reopening of the river of Aarhus, and pedestrianization of arterial roads (ibid.).

4.2. Ambitions and Focus Areas

In the next sections, the ambitions and focus areas will be identified in the chosen plans, strategies, and policy documents. For each document, a short description will introduce the section, followed by a description of the document and points of interests identified in the document. Using the interview conducted in the making of this dissertation, data from a previous project, as well as additional sources, these points of interest will be expanded upon to answer the questions proposed as in Figure 3.4. At the end of every subsection is a text addressing the specific relation to the urban ecosystems-based planning approach.

4.2.1 A Greener Aarhus: City of Aarhus' Policy on Nature and Green Surroundings

The municipality of Aarhus released this policy as a replacement for a number of previous more specific plans and policies treating the same subject matter (Aarhus Kommune, 2023c). In this way, it works to pool many separated policies into one overarching policy, with the ambition that it must be revised every city council period – in other words every 4th year (ibid.). The policy has a strong relationship with the plans treated in the next sections, as will also be seen in a read-through of these. However, this policy, as a dynamic document, works as a point of departure, treating dilemmas and specific focus areas which are then translated into concrete guidelines in the plans. As is written in the policy: » "A Greener Aarhus" must be seen in the context of the Municipal Master Plan. Ambitions and goals in "A Greener Aarhus" must be translated into concrete guidelines and framework for land use laid down in the Municipal Master Plan. « (Aarhus Kommune, 2023c:9). Specifically, these guidelines and frameworks are seen in the later treated municipal plan addendum, *A Greener Aarhus with more Blue*, and *Connected natural habitats* which is not treated in this dissertation (ibid.). Additionally, it clarifies administrative bases, goals and necessary measures. Three dilemmas are posited, laying out the problem area of the policy:

- Aarhus grows by 5,000 Aarhusians a year. In order to avoid the city spreading out into the surrounding countryside and open country, we are developing Aarhus as a denser city. At the same time, we have a goal that all Aarhusians must have a publicly accessible green area close to their home, which points more in the direction of a less dense city.
- Our ambition for experiences and stays as well as accessibility for everyone to nature and greenery must be weighed against the fact that we simultaneously want to protect and improve the habitats for animals, plants and other organisms.

- In the long run, our investments in new parks, nature and forest lead to reduced health costs, better protection of groundwater and increased property taxes. In the short time, however, the funding must be found in the inter-divisional political priorities.

Aarhus Kommune (2023c:8)

Furthermore, the policy details the added value the municipality of Aarhus has identified when focusing on increasing biodiversity and the betterment of nature. For the sake of brevity, rationales identified in the value-statements has been attached to the right of the statement, with a brief explanation for the identification where possible:

Statement	*Rationale*
Groundwater protection, when we create new natural areas and forest.	Resource protection, use-value of the ES is in focus.
New recreational spaces, where we can meet, exercise and experience nature.	Item conservation, intrinsic value of nature is in focus.
Good surroundings and facilities, that encourage to activity and movement through active and green mobility, play and sports as well as cultural experiences.	-
More plants and more trees along roads and streets can help reduce the speed of road traffic and increase the comfort for pedestrians and cyclists.	Resource protection, focusing on functional diversity, use values and is non-place specific.
Access to green areas with different types of experiences benefits mental and physical health.	Item conservation, place specific and focusing on the intrinsic value of nature.
The easy choice becomes the healthy choice; we make it even easier for all Aarhusians to integrate physical activity into everyday life.	-
Short distance to green areas makes an area more attractive and influences the choice of housing.	Item conservation, intrinsic value of nature is in focus.
Retention of water in the open country and in green areas reduces vulnerability to heavy rainfall and reduces damage costs.	Resource protection, the use value of ES and green areas is in focus. Non-place specific.
The waterways are improved when green areas contribute to natural balance in the water cycle, evaporation of water and percolation of rainwater.	Resource protection, referring specifically to water resources and its ecological health.
CO_2 emissions are reduced.	-

Table 4.1 Value-statements and their rationales. Statements from Aarhus Kommune (2023c:9)

As has also been addressed earlier, the rationales cannot and do not fit one-to-one with any statement and must therefore be taken with a grain of salt. However, as can be seen in Table 4.1, it provides an impression of the underlying rationalities controlling the focus of policy measures

and later plans. Additionally, it provides an understanding of which standpoint the municipality of Aarhus intends to argue for the allocating more physical space to green areas and nature rather than being build. The resource protectionist rationale is very clear in Table 4.1., emphasizing the monetary, mental, and physical anthropogenic benefits of ES. The plannability of ES and biodiversity, the arguments for why the municipality should plan for it when facing citizens, developers, and other stakeholders, therefore also stems from this rationale. Arguments can be inferred from this:

- ... that planning for nature and ES in the urban environment makes housing more attractive in the case of the developers.
- ... that it at the same time, through no substantial effort from the individual citizen, increases mental and physical health.
- ... that an investment in and planning for green mobility and *slower* modes of transportation can increase the profitability of local shops.
- ... and that it all at the same time can provide to mitigate substantial property damage from extreme weather events.

Going further into the policy, four main focus areas are presented; 1) Nature in the open country, 2) The green elements in the city, 3) Experiences and stays in nature and green surroundings, and 4) Co-creation on green projects. From the perspective of the municipality of Aarhus, it is believed, that through focusing on these areas, an increase in nature, biodiversity and ES are expected. Not to mention the added values presented in Table 4.1. The policy fully realized is seen visualized in Figure 4.2.

Figure 4.2 Vision for a greener Aarhus. Adapted from Aarhus Kommune (2023a:11)

1) Nature in the open country

This focus area has its point of departure in the green areas primarily outside of the city of Aarhus and its many neighbourhoods (Aarhus Kommune, 2023a). Within this is both an ambition for more new forests, retaining old forest growths, as well as increasing accessibility from the urban environment through creating green corridors and paths leading from the city to the green areas (ibid.). Additionally it is detailed, that there is an ambition for more 'wild nature' that is self-managing, using the rewilding project of Geding-Kasted as an example of this (ibid.). Here, water buffalo, wild horses and wild cattle were released to contribute in managing the areas, as well as restoring the nature to what was there originally (ibid.). Increasing the amount of larger connected green areas and afforestation are highlighted as central tools to doing this (ibid.). The municipality of Aarhus asserts themselves as central actors in doing this, concretely stating that they wish to take the lead, both by using municipal owned lands and increasing collaboration with green projects and private landowners (ibid.). Six goals are posited to achieve this:

- 4.000 ha of nature and 8.000 ha of forests by 2030
- 1.000 ha of nature by 2030 is wild and self-managing with year-round grazing animals
- 40 % of all nature protected in the municipality are of "good to high natural condition" by 2030
- 80 % of the municipally owned areas of nature are of "good to high natural condition" by 2030
- All afforestation projects contribute to increasing biodiversity
- 800 ha of forest are to be managed as wilder forests by 2030, with focus on biodiversity, more natural processes and without commercial production

Aarhus Kommune (2023a:15)

2) The green elements in the city

Urban nature is the focal point of this section, taking its point of departure on the non-monetary value urban ecosystems has for both mental and physical human health, but also the services it provides in terms of temperature regulation, water runoff, air quality, etc. As is stated in the policy:

> *(...)* it is all about increasing the quality and proportion of greenery in the public areas by securing space for new trees, green and inviting edge zones as well as green roofs and facades. And it is all about securing more good and well-designed green areas with more species diversity in connection with the urban development of both publicly- and privately-owned land areas.

Aarhus Kommune (2023a:17)

Several plans and policies are included in the margins of the document as examples of how the municipality enacts the ambitions set in the policy. These include their pedestrian strategy from 2020 and policy for urban quality and architecture from 2021, which both puts wait on increasing the quality of the built environment through including more green, thereby also making it more safe and walkable for pedestrians (ibid.). They also, for future urban

development, wish to make quantitative and qualitative demands for greenery and nature in private development projects (ibid.). This is concretized in their municipal plan which is also treated in section 4.2.2 of this thesis. As with the previous focus area, goals are posited to achieve this:

- The Aarhusians must have a publicly accessible green area close to their home
- 10.000 new trees will be planted in the city in the period from 2017 – 2025
- Trees on publicly owned land must be preserved as far as possible
- Public green areas must be preserved and developed with a view to greater accessibility and a great variety of experiences
- All new urban development areas must contribute to a greener Aarhus with more quality and variety, good growing conditions for trees and space for water

Aarhus Kommune (2023a:18)

For the first point, the municipality of Aarhus has formulated a criteria, which states that "*(...)* Aarhusians must have a maximum of 300 m to a publicly accessible green area of a minimum of 0.5 ha *(...)*" (Aarhus Kommune 2023a:18).

3) Experiences and stays in nature and green surroundings

This focus area of the policy document has several sub focus areas. These are identified as accessibility for citizens, mostly in terms of supporting citizens with and without disabilities, sports and culture, and communication about nature (Aarhus Kommune, 2023a). Sports and culture treats initiatives related to using nature for events, green mobility of citizens through varied and exciting paths, and the possibility of doing outdoor activities such as running or outdoor fitness areas (ibid.). Communication shifts the weight to how information about nature, its services and its impacts on human health and culture is communicated to users of these natural areas (ibid.). Here, the municipality of Aarhus especially points out their app 'Discover Aarhus', but also points to the importance of human-to-human interaction through education in and about nature (ibid.).

As with the previous two points, a list of goals is also provided here:

- Even more Aarhusians must have easy access to nature and the green areas and be able to enjoy an active life in green surroundings
- Green activities and outdoor opportunities must be located across the municipality, and there must be access and offers for everyone
- When building and developing in peri-urban landscapes, outdoor life must be incorporated from the start, with green connections, forests, water and natural areas
- In the public survey of the Aarhusians' opinion of what makes Aarhus a good city to live in, the city's nature and green areas is assesses as one of the two most important parameters

Aarhus Kommune (2023a:26)

4) Co-creation on green projects

The last of the focus areas broadens the perspective to the whole of the municipality, elucidating the need for an integrated approach for a development which favours a green urban development. To do this, the municipality wishes to, and already has in some cases as with the national Green Council, establish strong partnerships with landowners, local communities, organizations and companies (Aarhus Kommune, 2023a). The previously mentioned Green Council is one of the main stakeholders, as well as the Danish Nature Agency, as the municipality states themselves, when it comes to addressing and informing peri-urban and urban planning decisions (ibid.). By increasing partnerships across the municipality of Aarhus, they also expect to see new grass root initiatives, such as the 'Pocket gardens' that are already happening, where planter boxes are placed in empty areas, often cultivating food for local residents and visitors (ibid.).

The goals of this focus area is as such:

- Citizens, landowners, associations, organizations and companies must be engaged to an even greater extent in creating green, biodiverse and recreational areas in the city and in the open country
- Many different citizen groups and viewpoints must be engaged in collaborations on green projects. This applies to both children, young people, the elderly and citizens with special needs, just as it applies to associations and organizations with various kinds of interests
- Aarhusians must be able to easily share their enjoyment of nature and experiences with each other

Aarhus Kommune (2023a:31)

Relation to Urban Ecosystems-Based Planning Approach

The City of Aarhus' policy on nature and green surroundings closely aligns with the principles of urban ecosystem-based planning. Both emphasize a holistic perspective that considers the broader environmental, social, and economic impacts of urban planning projects. Aarhus' policy consolidates various specific plans into a single overarching strategy, reflecting the ecosystem-based approach of considering projects at multiple scales. This includes local, regional, and global contexts, which is evident in goals like increasing biodiversity and establishing green corridors. The policy's focus on sustainable development, such as expanding forest areas and creating self-managing wild nature zones, aligns with minimizing GHG emissions and maintaining habitats.

Both approaches stress co-creation and community involvement. Aarhus' policy engages various stakeholders in planning processes, ensuring that green initiatives have local legitimacy and are rooted in the community. This mirrors the ecosystem-based planning goal of broad, equitable participation. Additionally, the policy highlights the health benefits of green spaces, central to both approaches. Initiatives like increasing urban green areas enhance residents' well-being and contribute to sustainability. The economic and functional benefits outlined in the policy, such as mitigating property damage from extreme weather and boosting local economies, reflect the urban ecosystem-based planning focus on the interplay between ecosystems, culture, and economy. Overall, Aarhus' policy has many relations to the urban ecosystem-based planning

approach, integrating holistic, sustainable, and an integrated approach to participation, to create a more livable and resilient city.

4.2.2 A Greener Aarhus with more Blue

This plan is an addendum to the overall municipal plan, which has the purpose of » *(...)* increasing the quality of the city by making the the city more green, whilst securing a robust and sustainable city, that merges space for water in green areas and in city spaces. « (Aarhus Kommune, 2022:7). It sets out to concretize some of the focus areas presented in the municipalities policy 'A Greener Aarhus', as also elucidated in the previous section 4.2.1. Some of the areas treated in formerly mentioned section is therefore bound to be repeated. However, most importantly, it puts the policy ambitions into concrete statutory actions and maps out a structure for the blue and green network the municipality has envisioned (ibid.). The focus concerning creation of green areas is both on the open land and the city, and their concrete way of doing this is both through the creation of the aforementioned visualization of ecological corridors, but also by setting a criteria, that new urban development and regeneration must include no less than 5 % of the collected are being allocated to green areas and parks (ibid:8). By doing this, they hope to create many small 'pocket parks', that are connected by ecological corridors, thereby ensuring equitable access to nature for all (ibid.). Another tool the municipality is introducing, is that of creating a 'Green Norm', which stipulates that in projects that are obligated to have a local plan, such as the building of commercial and residential, varied quality greenery must be included on the undeveloped areas of the lots (ibid.). This is both to ensure a varied plant life, but also to ensure a more efficient rainwater runoff (ibid.). As the municipality of Aarhus phrases it themselves:

> To ensure better quality of greenery in the undeveloped areas of urban development projects, a Green Norm has been established. This not only ensures the amount of planting in local plan-required commercial and residential construction but also serves as a method to ensure greater variation in the selection of plants and plantings, with an emphasis on preserving existing vegetation. The green elements in the city should contribute to a gentler microclimate. They should take the edge off summer heat and winter cold, provide softer acoustics, and help to mitigate the experience of traffic noise. As a side effect, more and more varied planting will also help improve biodiversity.
>
> Aarhus Kommune (2022:9)

The ES are put front and centre in the above quote, especially putting into focus their recreational and regulating services. An increase in biodiversity is seen as a 'side effect' of a more varied planting scheme, as well as the creation of ecological corridors and protection of already existing vegetation. In terms of an ES typology, the rationale dominating this typology is strongly resource protectionist. This identification stems from the non-place specific nature of the type of vegetation, the requirement of it being varied, as well as the focus on the use-values of the ES, referring to its ability to reduce traffic noise and temperature regulation. Scouring through the

rest of the addendum, this rationality is dominating, as has already previously been stated in the previous text. In an interview with 'Green Cities Europe', city architect at the municipality of Aarhus, Anne Mette Boye, especially put into focus the human relation to nature, importance of urban nature and the interconnectedness that is needed for the provision of habitats for biodiversity and ES, especially relating this to the proposed Green Norm (Green Cities Europe, 2022).

Relation to Urban Ecosystems-based Planning Approach

The addendum "A Greener Aarhus with more Blue" complements the broader policy "A Greener Aarhus" and aligns with urban ecosystem-based planning principles. It emphasizes holistic and multiscale planning by integrating green and blue spaces into urban development. The addendum sets concrete criteria, such as allocating 5% of new developments to green areas, ensuring interconnected ecological networks. It highlights the importance of ecosystem services, mandating diverse and high-quality greenery to enhance biodiversity, improve rainwater runoff, and moderate urban microclimates.

Focusing on resource protection and biodiversity, the addendum aligns with an urban ecosystem-based planning approach by preserving existing vegetation and promoting diverse plantings. It also emphasizes community involvement through the creation of 'pocket parks' and ensuring equitable access to nature. By translating policy goals into statutory actions, the addendum demonstrates a practical application of urban ecosystem-based planning approach, ensuring that sustainability and biodiversity are embedded in Aarhus' development processes.

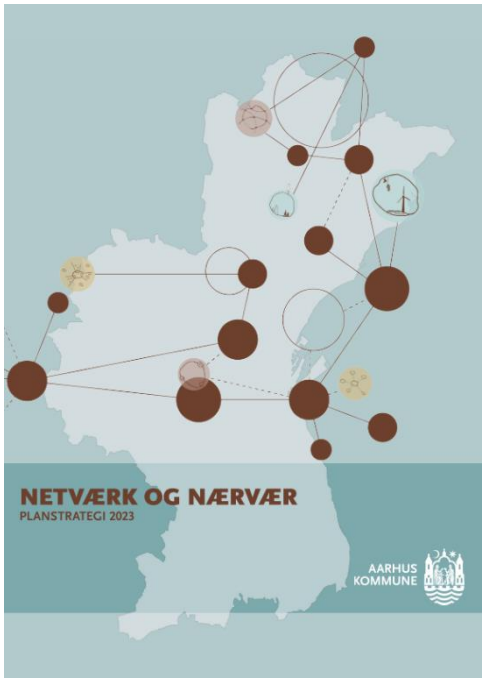


Figure 4.3 Front page of the municipality of Aarhus' planning strategy 2023. From Aarhus Kommune (2024)

4.2.3 Planning Strategy 2023: Networks and Intimacy

A planning strategy is a document, that a municipality must produce every fourth year, wherein the status of the implementation of the municipal plan – which must be revised at the least every 12th year – is reported on (Planloven, 2020). It must furthermore detail whether revisions to parts of the municipal plan must be revised, or if it needs a revision in its entirety (ibid.). As per the Danish Planning Act, a planning strategy cannot readopt a municipal without revisions, so its central function is to steer physical and strategic spatial planning in such a way, that it fits the contemporary planning and political environment (ibid.). In 12 years, many changes can happen, and policy focus can shift tremendously, so many municipalities choose to completely revise their municipal plans (Sehested,

2009). Planning strategies are in this way treated as more of a tool to outline new focus areas and long-term visions for the urban development of the municipality (ibid.).

Considering the planning strategy of the municipality of Aarhus in this perspective, it sets out a new developmental focus for the whole of the municipality, focusing on namely 'Networks' and 'Intimacy' (Aarhus Kommune, 2024a). The strategy was adopted February 21st 2024, and features both the aforementioned plan for the implementation of the municipal plan, but also their local Agenda 21 report, which is a statutory report also regulated by the Danish Planning Act (Planloven, 2020). In brief, it stipulates municipalities to address their impacts within five focus areas; 1. Dimunition of environmental impacts, 2. Promotion of a sustainable urban development and conversion, 3. Promotion of biological diversity, 4. Inclusion of citizens and the business community in the work with local Agenda 21, and 5. Promotion of the interplay between decisions regarding environmental, traffic-related, commercial, social, health related, educational, cultural, and economical circumstances. This aspect is included not as its own explicit part in the planning strategy but is more implicit.

The document is split into five main parts – foreword, on track to a good city for all, strategy for the physical development, planning till now, and public hearing. The part on the strategy contains the main substance of the strategy, and goes into details with six focus areas of development:

1. Aarhus as a growth engine for Eastern Jutland
2. Development with a point of departure in the landscape, nature, and water
3. An effective and sustainable mobility system
4. Focused urban growth
5. Holistic concerns in the open land
6. Strong local communities

Aarhus Kommune (2024:3)

These areas have been identified through a combination of the 'Aarhus goals' – as seen adapted in Figure 4.4 - and a recognition of the problems municipalities face being wicked problems, and thus needing smart and innovative solutions (Aarhus Kommune, 2024a).

Figure 4.4 The Aarhus Goals. Translated into English by author from Aarhus Kommune (2024:6)

The wicked problems were identified by the city council for the municipality of Aarhus, with a point of departure in the problem statement of what especially challenges the municipality in regards to being a good city for all (Aarhus Kommune, 2024a). The identified challenges are:

- Pressure on the environment – environment and sustainability
- Pressure on the trust – the democratic conversation
- Pressure on the labour force – recruitment and competencies
- Pressure on the public health – health needs to be a part of everything
- Pressure on the well-being – the youth's mental health and well-being
- Pressure on community cohesion – mixed neighbourhoods and integration

Aarhus Kommune (2024:8)

When asked for the background for beginning to work with planning problems as wicked problems in their planning strategy, chief officer of city strategy Bente Lykke Sørensen answered:

> *(...)*
> It is characterized by, if you use the solutions we have used so far, you will not solve the problems. *(...)* completely different solution initiatives are needed if you are to solve it. And therefore, these six themes have been defined, which among other things concern the mixed city, it concerns climate, and not least it concerns the socially sustainable city, particularly in relation to vulnerable housing areas, mental health, etc. So, these wicked problems, one might say, are a mandatory task, that no matter what product we create in this city, and the planning strategy is one of them, we are obliged to see what they can contribute in relation to solving some of those wicked problems that we face. And it is a good constraint to always think about it.
>
> Sørensen (2024)

Further also stating, that if these wicked problems are to be at least partially solved, every sector has to be involved – this includes all of the magistrates of the municipality of Aarhus, not only the planning department (Sørensen, 2024a).

This rationale permeates the whole of the planning strategy, where the six areas listed earlier are in constant relation to each other. City expansion and growth must be made from the perspective of the 15-minute city, where everything one needs to live a comfortable life is within 15 minutes of ones home – or it is at least strived for (Aarhus Kommune, 2024a). Ensuring that urban development happens close to green mobility solutions thus become central, as well as defining where these solutions will be in the future (ibid.). Furthermore, creating good ecological conditions for biodiversity and ensuring a connected network of green and blue areas also become a central focus are of this planning strategy (ibid.). Much of this focus is put on the planning of urban development in tandem with the natural contours of the landscape to take precautionary measures towards rainwater runoff, ensuring that areas with ground water interests are not used for industry nor urban development, but for raising forests, recreative interests, biodiversity, and other nature, and maintaining and bettering already existing landscape values (ibid.). In terms of the cohesion with nature in the urban environment, green wedges are being planned for, that ensures a green network permeates both rural towns and especially the city of Aarhus, as is seen on Figure 4.5.

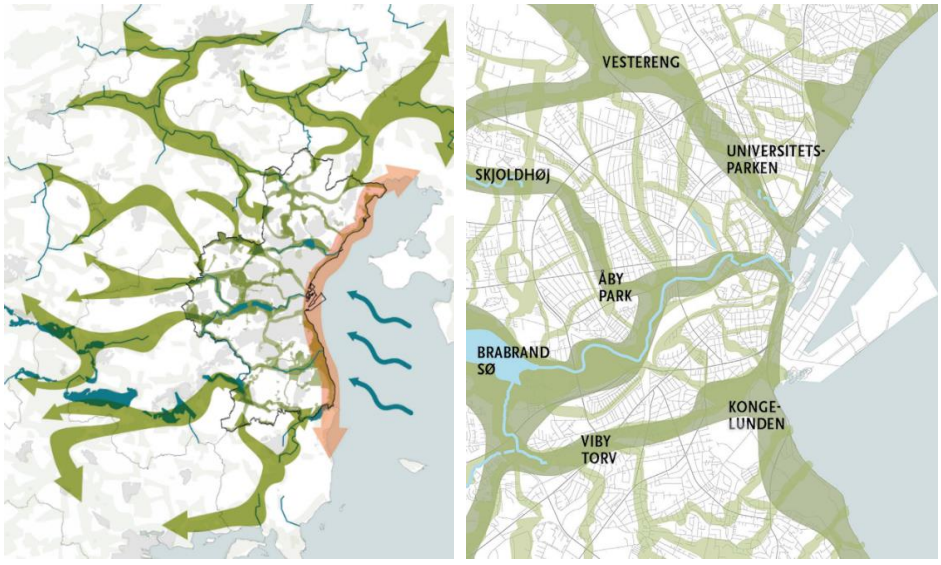


Figure 4.5 Green and blue networks in a regional perspective (left) and citywide perspective (right). From Aarhus Kommune (2024:8-9)

This network perspective also permeates an acute awareness of the municipality of Aarhus' regional significance, which is why much of the planning strategy not only deals with what is inside of the municipal boundaries, but also beyond it (Aarhus Kommune, 2024a). This is exemplified in the left picture on Figure 4.5., but also concerns urban development and public transport infrastructure inside and outside of the municipality (ibid.). Especially a more efficient usage of the municipality's areas are high on the agenda, and in the strategy it is proposed that partnerships and coordinated initiatives with neighbouring municipalities and private actors could achieve this wish (ibid.). This is both in terms of creating larger landscapes for biodiversity and nature, but also to pool resources for the production of green energy and foodstuffs (ibid.).

An element that is also central in the planning strategy is that of coordination towards a more sustainable urban development (Aarhus Kommune, 2024a). This is both proposed through closer partnerships with both public and private actors, but also a more integrated effort for citizen participation in planning projects as well as conscious effort to set clear criteria for investors and developers, and say no to project proposals that do not meet these criteria (ibid.). Later, in section 4.3.1, a concrete example of when this is the case will be explored. To achieve these ambitions, as is the purpose of the planning strategy, numerous revisions to the municipal plan as well as proposals for the formulation of new policies is proposed (Aarhus Kommune, 2024a). These range from cancelling projects, to changing framework conditions in the municipal plan – in terms of the green networks shown in Figure 4.5., it entails reserving these areas so as they are not able to be built (ibid.). Furthermore, the municipality of Aarhus wishes, in the framework of the 15-minute city, to create city sketches, that can aid the city council in the urban development of both their rural towns, neighbourhoods and the city of Aarhus (ibid.).

> This also means that we will increasingly set requirements for development and also say 'no thanks' or 'not right now' if project proposals do not fit into the overall direction or align with development elsewhere.
>
> Aarhus Kommune (2024:14)

Relation to Urban Ecosystems-based Planning Approach

Putting the planning strategy into the perspective of the urban ecosystems-based planning approach, many of the same theoretical grips are being used. Most prominently is the holistic perspective and the network perspective that is being perpetuated, as well as the conscious effort to push for a more integrated approach to urban development. In the strategy, both the production and usage phase are being put weight on, with especially the ability to use green modes of transport being put in the front. Furthermore, reusing already existing buildings, or their materials, is being lauded as the way to go when building new. This to try and limit their CO_2e, which is also one of their goals for 2030 – being a CO_2-neutral municipality.

4.2.4 Sub-conclusion

Harkening back to the questions posed in Figure 3.4, this sub-conclusion seeks to answer first the question: "What are the intentions and ambitions behind the strategies, plans, and policy documents for the municipality of Aarhus, when focusing on nature and biodiversity?", and next: "Through which measures, initiatives and focus areas does the municipality of Aarhus wish to implement their strategies, plans, and policy?"

Regarding the first question, a clear ambition to increase the amount of biodiversity and ES in the overall municipality of Aarhus is clear. Furthermore, this is argued from the standpoint of biodiversity and ecosystems place in the betterment of human mental and physical health, as well

as the services they provide in terms of, among others, temperature regulation, carbon sequestration and absorption of noise from vehicles and other noisy activities. This is also speaks into the value-add proximity of green areas have for property values.

Going further into answering the second question of the measures, this is seen through a multiscale perspective, focusing on place, local, and municipal. Furthermore, an extensive afforestation plan is proposed together with increasing the number of protected areas in the municipality. This to ensure an ecological network of green corridors, and with a specific focus of raising forest where there are groundwater interests. Another measure they wish to extend is that of introducing more rewilding measures in the municipality, primarily focused in the open country. When it comes to urban environments, clear guidelines have been set forth following the addendum on 'A Greener Aarhus with more Blue', introducing the green standard proposing that a minimum of 5 % of undeveloped areas in residential and commercial developments must include varied quality nature. Additionally, strong partnerships with landowners, associations, citizens and organizations is sought, so as the municipality can ensure broad participation of stakeholders, as well as get the aforementioned on board. An integrative approach to participation.

4.3. Concrete Planning Initiatives

As is proposed in the analytical framework presented in section 3.6 and as seen in Figure 3.4, this section will focus on elucidating specific planning initiatives, which serves to concretize the ambitions and focus areas treated in the former sections 4.2.1, 4.2.2, and 4.2.3. Each section is supplemented by a figure visualizing the extent of the area treated and its geographical location in the municipality of Aarhus. All GeoData utilized stems from SDFI (2024) with a subsequent treatment in Adobe Illustrator.

4.3.1 Aarhus Ø

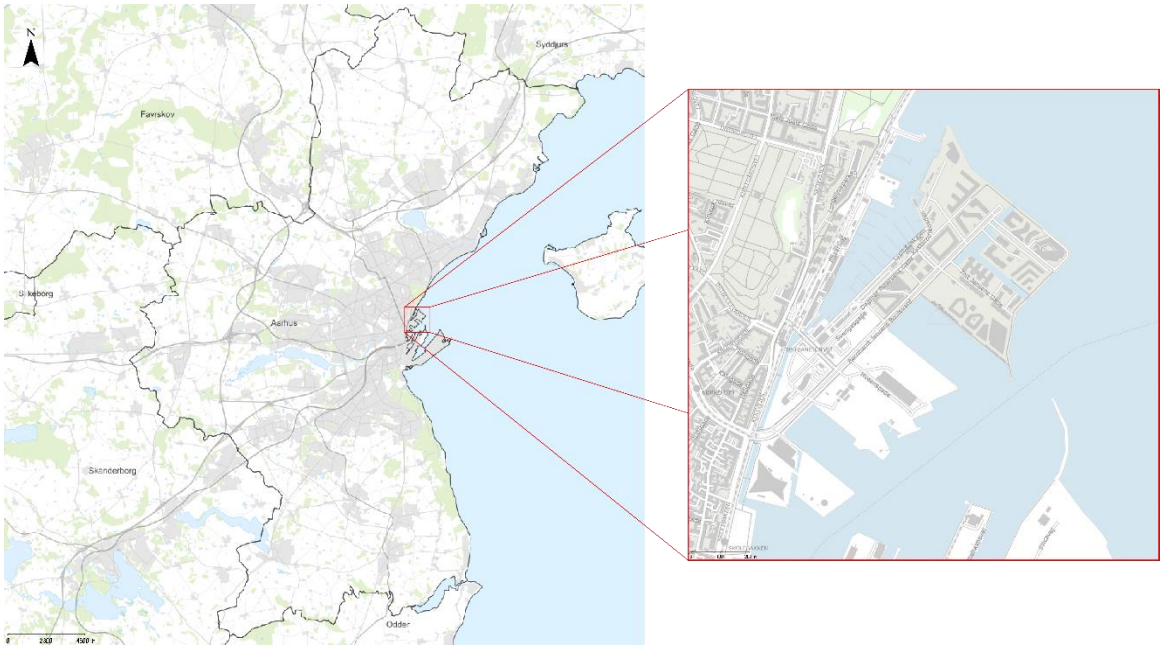


Figure 4.6 Extent of Aarhus Ø

Aarhus Ø is a waterfront regeneration project, which began its redevelopment back in the early 2000s (Frederiksen et al., 2023). The purpose was to reuse the brownfield areas, left behind from its past as an industrial harbour, and thereby relaunching the area for commercial, residential and recreational uses (ibid.). Especially the blue elements were a big part of the initial planning of Aarhus Ø, where all the piers were supposed to be split into islands, also giving the place its name (ibid.). The vision was to make it a prime spot for all water-related activities, which, as is corroborated in an interview conducted in the previous semester project with municipal staff and the local citizens council, neglected the inclusion of green areas (ibid.). However, a patch of green areas with on Pier 4 – the most northeastern part of the area – called 'Ø-linjen' was pushed through, settled in between buildings and being used primarily as, as is stated by the same representatives of the local citizen council, a dog walker park (ibid.). As a result of the financial crisis in Denmark in the end of the 2000s – start of the 2010s, lots on Pier 4 were sold quickly by the municipality of Aarhus, giving exemptions from original plans (ibid.). The result is the many tall buildings which now adorns Pier 4's skyline, including the aptly named 'Lighthouse', which stands as the tallest building in Denmark as of writing this (ibid.).

This skyline can be seen on Figure 4.7, with Pier 4 and inner Aarhus Ø in the background, and Pier 2 with its 'Biodome' in the foreground. The latter is the city-park initiative, which is a temporary park opened in 2022 with the explicit purpose of bringing more biodiversity and green areas into the city (Frederiksen et al., 2023). Herein including the use of the aforementioned pocket parks, establishment of insect houses, and the start of an initiative called 'Ø-honning', where the honey produced by the bees in the city-park is sold to residents and visitors (ibid.).

Figure 4.7 Aarhus Ø captured from the south on Dokk1 by the author

Going back to the development of Aarhus Ø, and following a realization from the municipality of Aarhus, that the development hitherto was not satisfactory because of the urban environment being 'dead' i.e. no city life, a principle for the further development was adopted – city life before places before buildings (Sørensen, 2024b). Also, an integrated approach was adopted for participation, seeking partnerships for the urban development with private investors, developers, organizations and citizens (ibid.). The result was first and foremost the development plan for basin 7 in 2014, which introduced the strategic usage of temporary urbanism to pull people to the area, as well as being a ground for experimental business-cases (ibid.). A harbour bath was also planned for to increase the urban life (ibid.). The planning for Aarhus Ø has undergone a similar process, especially putting weight on garnering a broad participation of citizens and using their input in the planning process (ibid.). These inputs were used to identify 'strategic themes', which then the municipality of Aarhus used to search for suitable developers, ending in the creation of an 'urban development corporation', which then works from the aforementioned themes in the creation of a master plan (ibid.).

Following the completion of the planning of Pier 4, is now that of Pier 3, which had its planning process beginning in 2022 (Sørensen, 2024b). This, with an expanded participation process involving 3.500 individuals and 20 associations through informational meetings, city walks, digital involvement, workshops, and involvement of children and youth groups (ibid.). The planning of Aarhus Ø has garnered immense both national and international attention and publicity, winning several awards ranging from city-life and architecture all the way to creating mixed living (ibid.). As a result, the public of the city of Aarhus has had an increase in the interest of the further planning of Aarhus Ø, with Pier 3 becoming a sort of 'battleground' for proposals between different architectural firms, developers, and citizen groups (ibid.). The proposals therefore range from making the whole of Pier 3 and remaining undeveloped areas into a park, to visions like that of Pier 4 (ibid.). However, as Bente Lykke Sørensen has stated, none of these proposals have been chosen in universum – instead, many of the elements have been considered

and have been a part of formulating strategic themes for the urban development corporation (ibid.). The strategic themes were released in a report in 2023, and are:

- Keep the maritime mood
- Create more green areas
- Gently open up for the rest of the city
- Strengthen the associations and give them room
- Be a frontrunner in the sustainable development on Aarhus Ø
- Make space for sports facilities
- Make space for diversity and the odd-one-outs
- Make the infrastructure more safe
- Establish a promenade
- Create good conditions for visitors
- Make space for events

Sørensen (2024b)

Sørensen furthermore highlights another new aspect in the development of Pier 3, which is that the city council of Aarhus has chosen to want substantially less floor space on Pier 3 and wider gaps between buildings, also incorporating more green elements through varied and quality nature, as has been uncovered in the previous sections on the policies and plans (ibid.). Furthermore, a new model incorporating physical economy and realization scenarios has been adopted, injecting also municipal funds into the development (ibid.). This is to increase the municipality's stakes in the development of Pier 3, ensuring their active involvement in its planning and execution (ibid.). The structure of the urban development corporation can be seen in Figure 4.8.

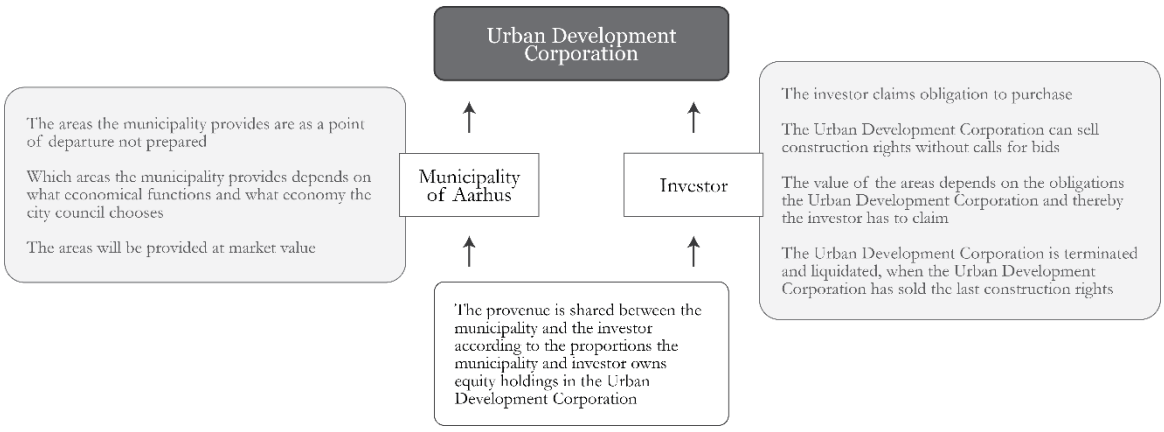


Figure 4.8 Structure of the Urban Development Corporation. Adapted from Sørensen (2024b)

A clear takeaway from the further development of Aarhus Ø is, that the city council wishes, as has also been stated in the previous sections on plans and policies, to incorporate more quality and varied greenery into their new commercial and residential developments (Sørensen, 2024a). Adding onto this, they are incorporating a more integrative approach to participation, and through this are setting clear criteria – through the strategic themes and role as an active part of development – for the investors wishing to develop their areas.

4.3.2 Vesterbro Square

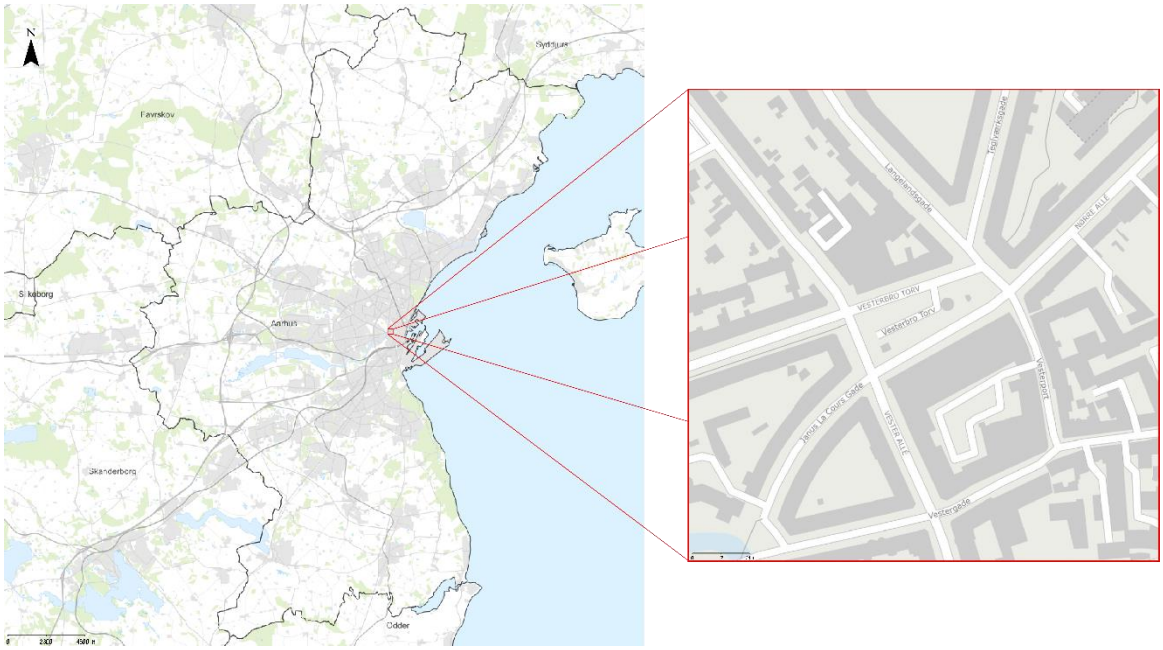


Figure 4.9 Vesterbro Square

Vesterbro Square is central in downtown Aarhus, and is a thoroughfare for many motorists everyday either using it is a slipway or as an access to the rest of downtown Aarhus (Aarhus Kommune, 2023b). However, in 2018, as a part of their mobility plan, the city council of Aarhus chose to close it in the future for private motorists, as a part of a grander plan to make the downtown area more accessible for vulnerable road users, more walkable and greener (Aarhus Kommune, 2018, 2021). Additionally, also as a part of their plan to create a bus rapid transit system to service the city centre (ibid.).

In 2023, the municipality of Aarhus released their plan for the area, presenting two scenarios – a small square and a large square (Aarhus Kommune, 2023b). The former allowing both busses and motorists, and the latter only allowing busses (ibid.). These two scenarios can be seen on Figure 4.10, where option B was chosen by the city council (ibid.). Today, there are two roads on each side of the square, encapsulating a parking lot in the middle of the street. A redevelopment of the area, as the plan proposes, would therefore entail a substantial change of the square and mobility patterns of the motorists. As has also been presented in brief earlier, this, and other large infrastructure changes, has resulted in a citizens uproar (Poulsen, 2024).

The plans for closing the square has been put on hold until approximately January 2025, but not exclusively because of the uproar, but also because a new political debate and negotiations has been opened up in regards to a new climate action plan and green mobility plan, where the balances between the green avenues, road access, and green parks will be treated (Sørensen, 2024a). This will, as Sørensen states, however not change the overall plans of closing the square, as it was decided in the mobility plan of 2018 (ibid.).

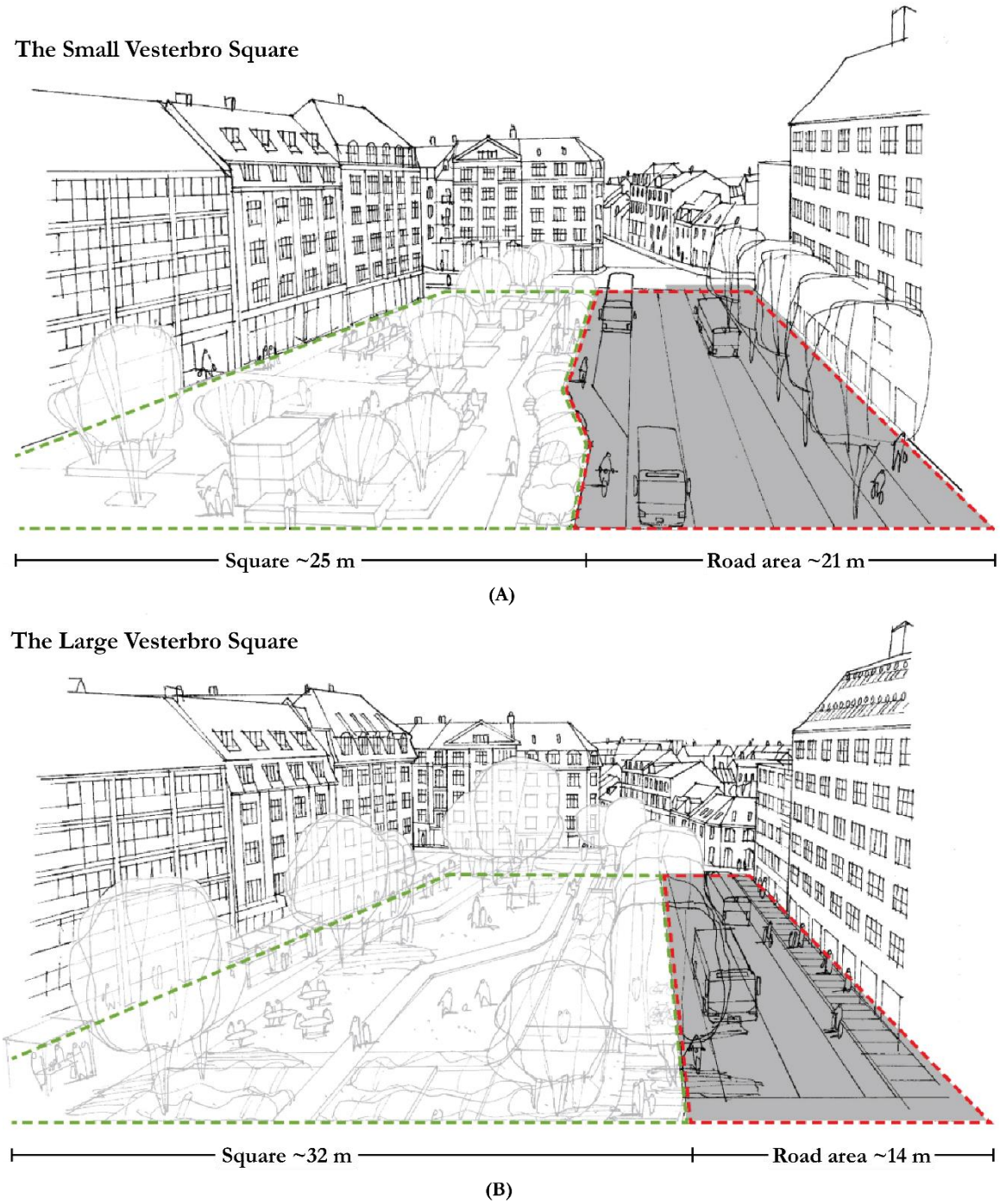


Figure 4.10 Scenarios for a small (A) and large (B) Vesterbro Square. Adapted from Aarhus Kommune (2023b:8)

The main takeaways in relation to the thesis subject of the above are, that there is a missing element of citizen participation, but that the ambitions of the policies and plans shine through in wanting more biodiversity and natural areas in the city, supporting the ecological networks. However, these good intentions and ambitions can quickly fail if they are not realized relatively quickly from their inception, and with the support of users and citizens. How the future of the project looks one can only guess.

4.3.3 Frederiks Avenue

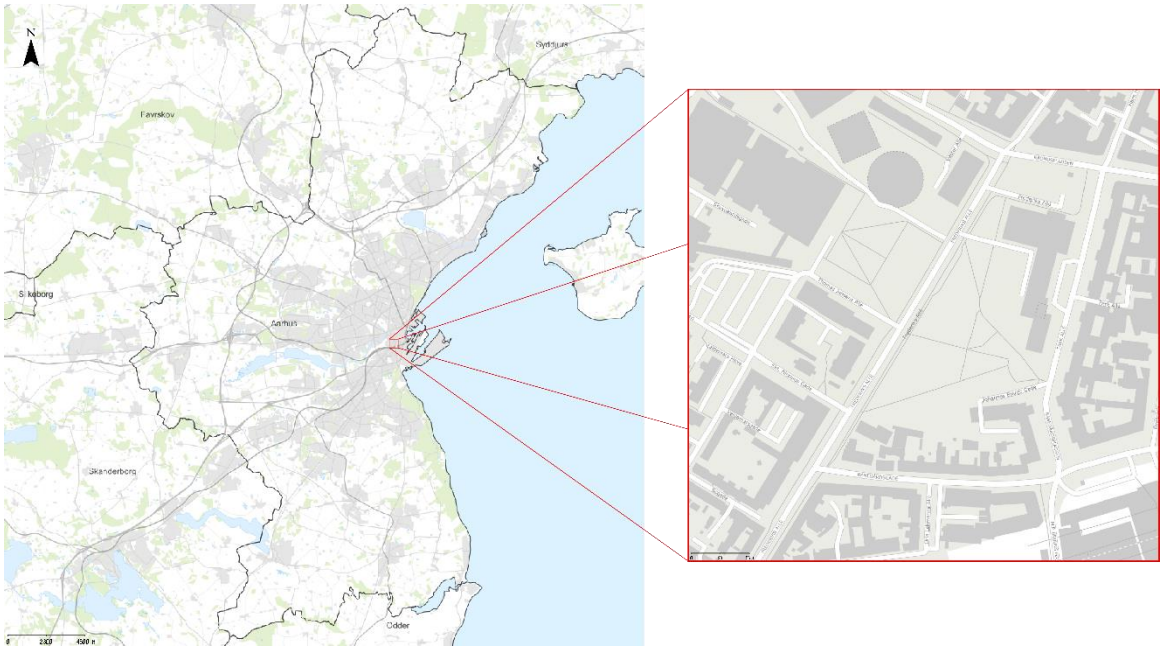


Figure 4.11 Frederiks Avenue

The case of Frederiks Avenue is, as of writing this thesis, the most recent of the concrete planning initiatives presented. As it stands right now, there exists a comment about possibly closing it and forming a park from the mobility plan of 2018 (Aarhus Kommune, 2018), as well as restating it in the vision for the downtown area (Aarhus Kommune, 2021), but as it stands now, as it appears in the minutes from the city councils meeting March 6th 2024 and its appendices, only a principle decision has been made regarding the fusion of 'Musikhusparken' and 'Rådhusparken' (Aarhus Kommune, 2024b). It must also be pointed out that the name of the point in the minutes is '13. Answer to the proposal from S about Simonsen's Garden' and includes in its decision points closing down Frederiks Avenue and merging the two parks (ibid.). Finding the specific point without prior knowledge about the case was therefore not straightforward and required some amount of digging. Included in the minutes are also an audio player of the debate of the specific segment, which has added reflections about the rationales used when discussing this and the case of Vesterbro Square. Because of their proximity to each other, and usage as thoroughfares for motorists, changes to one often has a large effect on the other, creating oftentimes congestion in the traffic. The arguments used in the debate from the opposing side thus also highlighted this, with a specific focus on the combined problems the deconstruction of parking lots, closing down and in some cases introduction of one-way traffic has for the accessibility of the city of Aarhus (Aarhus Kommune, 2024b). Harkening back to the arguments identified in section 4.2.1, especially the perspective of the citizens mental and physical health, as well as creating a 'green oasis', was used to argue for the proposal (ibid.). This is of course not the only reason highlighted, and as is also ascertained in the audio clip, the debate has gone on for many years prior, and has also been to debate in the city council several times in the period the current council has been in power (ibid.).

The decision point to close Frederiks Avenue was adopted as a principle decision, and, as was also stated earlier, does not have any actual regulatory meaning (Aarhus Kommune, 2024b). However, this does not mean the debate on the proposal is done, as, which is also the case for Vesterbro Square, the realization is suspended until the green mobility plan for the municipality of Aarhus has finished negotiations and is adopted sometime in January 2025 (Sørensen, 2024a).

4.3.4 Sub-conclusion

Going back to the expanded analytical framework in Figure 3.4 on page 32, the question preluding this section was: “In the case of Vesterbro Square, Frederiks Avenue, and Aarhus Ø, how are the ambitions and focus areas of the strategies, plans, and policy documents concretized?” This sub-conclusion will therefore, using the results of the analysis of aforementioned cases, identify an answer, which are provided in the next subsections.

Aarhus Ø

Aarhus Ø serves as a prime example of waterfront regeneration, aiming to repurpose brownfield areas into vibrant commercial, residential, and recreational spaces. Initially conceived as a hub for water-related activities, the development faced criticism for neglecting green areas. However, interventions such as the introduction of 'Ø-linjen' and the creation of the city-park on Pier 2 demonstrate a shift towards incorporating biodiversity and greenery. The municipality adopted a principle of "city life before places before buildings," emphasizing the importance of vibrant urban environments. Through partnerships and broad citizen participation, strategic themes were identified, guiding the development process. The incorporation of more greenery and an integrative approach to participation reflect the municipality's commitment to sustainable urban development.

Vesterbro Square

The redevelopment plans for Vesterbro Square underscore the municipality's efforts to prioritize accessibility, sustainability, and green mobility. Proposals to close the square to private motorists align with broader initiatives to enhance walkability and create a more environmentally friendly urban landscape. While facing opposition and delays, the plans signify a commitment to realizing the ambitions outlined in mobility and climate action plans. The ongoing debate highlights the complexities of balancing diverse stakeholder interests while striving for sustainable urban transformation.

Frederiks Avenue

The case of Frederiks Avenue epitomizes the intersection between mobility, green space, and urban planning. Proposed initiatives to close the avenue and transform it into a park reflect the municipality's vision for creating green oases and promoting active transportation. Debates surrounding the decision emphasize the importance of considering citizens' health and well-

being, alongside practical considerations such as traffic congestion. Despite facing regulatory uncertainties and continued deliberations, the principle decision signifies a step towards realizing the municipality's green mobility objectives. However, further measures are to be seen when the negotiations on the green mobility plan is finished and presented in January 2025.

In conclusion, the cases of Aarhus Ø, Vesterbro Square, and Frederiks Avenue illustrate the practical outcomes of the municipality's strategies, plans, and policies presented in the previous sections. Additionally, they also present a clear picture of the complex nature of urban planning and the multifaceted nature it takes, especially when planning for ES and biodiversity in urban settings.

4.4. Summary of Results

In this section, the results of sections 4.2 and 4.3 will be used to provide an answer for sub-research question 2: "*In what ways does the municipality of Aarhus incorporate an urban ecosystems-based planning approach into their urban planning strategies?*" The sub-conclusions presented in sections 4.2.4 and 4.3.4 will be used as a basis for answering the sub-research question, as well as the understanding of an urban ecosystems-based approach presented in Box 2 in section 2.3.1. The municipality of Aarhus demonstrates a commitment to this approach through various initiatives and policy frameworks aimed at enhancing biodiversity, ecosystem services, and sustainable urban development.

The understanding of urban ecosystem-based planning adopted in this thesis underscores the importance of viewing urban planning projects holistically, considering their impacts on both the built and natural environment. This approach emphasizes the interconnectedness of urban development with broader ecological systems, recognizing the value of ES in enhancing human well-being and mitigating environmental challenges. By incorporating principles such as co-creation, collective solutions, and inclusive participation processes, the municipality seeks to ensure that urban planning decisions are rooted in community needs and values.

In examining the ambitions and focus areas of policies and plans in Aarhus, it becomes evident that biodiversity and ES are central considerations. The municipality aims to increase biodiversity and ES across various scales, from local neighbourhoods to the overall municipal area. This is reflected in initiatives such as afforestation plans, the establishment of protected areas, and the integration of green standards into urban development projects. By prioritizing green infrastructure and fostering partnerships with stakeholders, the municipality strives to create a network of green spaces that enhance ecological connectivity and support biodiversity.

Concrete planning initiatives further exemplify the municipality's commitment to urban ecosystems-based planning. Concrete planning initiatives such as Aarhus Ø, Vesterbro Square, and Frederiks Avenue showcase how strategic planning decisions are translated into tangible outcomes on the ground. These initiatives demonstrate a shift towards more sustainable and environmentally friendly urban development, characterized by the integration of green spaces,

pedestrian-friendly design, and active transportation options. Through these efforts, the municipality of Aarhus is not only enhancing biodiversity and ecosystem services but also creating more liveable and resilient urban environments for its residents.

In conclusion, the municipality of Aarhus already substantially incorporates an urban ecosystems-based planning approach into its urban planning strategies through a combination of policy frameworks, community engagement processes, and concrete planning initiatives. However, as has been preluded in an earlier section, this is not explicitly because of having incorporated an urban ecosystems-based planning approach. The attribution for there being as many like elements is instead found in a political will, that wishes to favour environmental and biodiversity concerns in their policy and planning. And as is always the case of politics, political will is as fragile as the next electoral period. A systemization of the urban ecosystems-based planning approach, using it as a planning norm, is therefore still relevant to consider.

Chapter 5. Discussion

The present chapter constitutes the discussion of this thesis, and seeks to uncover different aspects of the third sub-research question, which shortcomings could an urban ecosystems-based planning approach have? Throughout the writing of this thesis, several discussions with both laymen, the supervisor of this dissertation, friends with interests in the subject matter treated in this thesis, and colleagues on the master's program have laid the foundation for this chapter. Pointing out the aspects of the presented approach, which needs to be reflected on in order to gain a grander understanding of the shortcomings the approach has. The result is the two sections below, 'economy v. ecology – a new ideal for growth?' and 'urban with or without nature?'. Additionally, attending conferences on the subject matter as well as reading books discussing these aspects have provided invaluable insights into the flaws of the proposed approach. To open this chapter, first, a discussion on economy v. ecology focusing on the debate of introducing a new ideal for growth be elucidated. Following this a discussion on the urban with or without nature commences, focusing on specifically the statement of if one really wants to do something for biodiversity and ES, then it is best to do it in the open country. Concluding this chapter will be a summary, seeking to answer the third sub-research question using the points from the discussion sections.

5.1. Economy v. Ecology – a new Ideal for Growth?

While the title of this section might inspire the thought of there being a conflict between concerns regarding economy and ecology in urban planning, it must instead be considered from the standpoint of the ideal of growth that is perpetuated. I.e. the ideal used as a point of departure when evaluating planning projects. For the issue of what the focus on when doing urban planning projects does not necessarily have to focus on one or the other – elements of both can be in a project without interfering or being in conflict. However, what is necessary to discuss and reflect on in terms of an urban ecosystems-based planning approach and is probably also the most contagious aspect of it, is that it inevitably will but ensuring healthy ecosystems before considering economic profit and growth. This is not because profit and growth is considered bad, but because there is another understanding of the concepts. An investor of course always needs to consider the profitability of development projects, but if profitability is seen from the

perspective of maximizing the amount of floor space in a small area with no regard to creating a liveable, sustainable and resilient city nor its surroundings, then it is necessary to institute a new understanding of that very concept. This is especially harkening back to the plannability of ES and biodiversity. In order to have investors and developers see sense in doing this kind of development, one must first make the business case and make its value explicit. Several other cases of seemingly non-profitable initiatives have already been introduced into urban planning, that in both the short- and long-term show themselves to have a great value for both human and environmental health, and have economic benefits as a result thereby being profitable. Examples include planning for bicycles (Jensen et al., 2017), planning for mixed housing (Sørensen, 2024a), and planning for urban and peri-urban ES (Geneletti et al., 2020; Juniper & Windsor, 2013).

Both when discussing the concepts of growth and profit, the concept of value is inevitable. What is considered valuable has an equal effect on what is considered profitable and what then constitutes growth. Latour & Schultz (2022) have already been presented briefly in the introduction but are especially relevant to use here when discussing growth. Growth for them is not measured in GDP or in any other monetary terms, but is instead measured through liveability, resilience, sustainability, and well-being. And they are not alone in thinking about how value and growth is measured, as during the writing of this thesis, a book by Danish feminism activist and gender policy consultant Emma Holten (2024) named 'Underskud' discussed the topic of how value is measured in terms of welfare, and how it is often forgotten in the contemporary methods of measuring value. In other words, contemporary value, profit and growth concepts need to be reevaluated, which is also the main point of this discussion topic – that in order to achieve a more sustainable development, and adopt an urban ecosystems-based planning approach, one must also change the understanding of what is valuable, what growth constitutes and what is then profitable. Introduced in section 2.2. is already one such understanding from Hammond & the Silva Forest Foundation (2002), regarding the hierarchical relationship between ecosystems, cultures and economies – that economies are part of human culture, and that human culture is part of ecosystems. Therefore, restoration and protection of ecosystems leads to healthy cultures and economies.

Counterarguments, of which the author is acutely aware, would include the argument that prioritizing healthy ecosystems over economic considerations could hinder economic growth and development. They may contend that stringent environmental regulations or conservation measures could impose burdensome costs on businesses and developers, discouraging investment and stalling urban development projects. Additionally, there may be concerns about job losses in industries that rely on natural resource extraction or land development. Moreover, sceptics might question the feasibility of achieving both ecological preservation and economic prosperity simultaneously, fearing that stringent environmental protections could stifle innovation and competitiveness in urban markets. These objections underscore the complex interplay between economic interests and environmental conservation in urban planning, highlighting the need for nuanced approaches that balance ecological sustainability with economic imperatives.

5.2. Urban *with* or *without* Nature?

A topic that has often been discussed in the writing of this thesis, is the role of the urban environments in ES and biodiversity concerns. Critics might point to the fact, that if one really wants to favour biodiversity and ES, then planning for large natural reserves in the open country is the way to go. Meanwhile building densely and high in urban environments, prioritizing increasing population density and getting people to move into the city. However, while it is acknowledged that large natural reserves preferably with rewilding measures are of course what would increase biodiversity and help ecosystems the most, it is not seen as mutually exclusive for incorporating a greater amount of nature and biodiversity in the city. Furthermore, making this stringent urban and nature divide is in this thesis believed to be more harmful than it is helpful. This is not only as it perpetuates an understanding that humans are independent of nature, but also that the impact a more urbanized society would have on its surrounding environment likely would be greater. Whether people live in or outside of nature, there is still a need to pull on several ES to just survive. Additionally, as is seen around the world in numerous million cities, pollution, whether it be light, GHG emissions or others, is rampant in completely urbanized environments. In other words, there is a need for having the urban *with* nature.

Throughout this thesis many examples have already been provided on what nature and ES does for humans, and that it therefore should not exclusively be allocated to outside of the cities. An urban environment with access to green areas containing varied and quality plants is beneficial for both people and biodiversity. It provides greater runoff of water in extreme weather events, and improves the resilience and sustainability of cities. However, as the author is also acutely aware of, a future where people live like we do today is not possible if we want to meet a sustainable future and have more resilient and liveable cities. Like the quote on one of the first pages of this thesis states: "The planners have one idea of the good life, *(...)* but the market and the realtors have another narrative. *(...)* many dream of a life, that isn't possible within the planetary boundaries." (Køge Kommune in Wulff, 2024). A change of the way we live is therefore needed. However, this is not inside the scope of this thesis, but could be an interesting point of departure for a future project.

The practical implications of incorporating an urban ecosystems-based planning approach into the design of urban environments is also important to discuss in this context. As has already been elucidated in previous sections, while the ambitions and focus areas are clear and point in the direction of incorporating such an approach, the reality is rarely the same. Not only is it a long and grievous affair, which changes fundamentally in the function of the city, it also requires long-term political and citizens support. Sørensen (2024a) pointed this out when talking about the planning of Aarhus Ø, that the wishes of the citizens, and by proxy the politicians, have changed drastically in just the past 10 years. One could therefore only hope, that incorporating such an approach would be long-lasting. This is of course also a given, that everything is dynamic, and so is urban planning.

5.3. Summary

This section will focus on answering the third sub-research question, which is included in the introduction of this chapter. The focus is on the shortcomings and challenges that need to be addressed concerning incorporating an urban ecosystems-based planning approach, using the points presented in the last two sections.

An urban ecosystems-based planning approach offers substantial benefits, but it also presents potential shortcomings. The tension between economic interests and ecological considerations is a primary concern. A discussion on the very concepts of value, growth and profitability needs to be addressed, so a common understanding can be utilized. Critics may argue that prioritizing ecosystem concerns could hinder economic growth by imposing burdensome costs on businesses and developers. Additionally, sceptics might question the feasibility of achieving both ecological preservation and economic prosperity simultaneously, fearing that stringent environmental protections could stifle innovation and competitiveness in urban markets. The plannability of biodiversity and ES therefore needs to be addressed in terms of the value-definitions identified.

Another shortcoming is the challenge of integrating nature within urban environments. While incorporating nature into cities offers numerous benefits for biodiversity and human well-being, it also presents practical challenges. Additionally, concerns about the feasibility of achieving sustainable urban development within planetary boundaries are raised, suggesting a need for fundamental changes in the way we live.

In conclusion, while an urban ecosystems-based planning approach offers numerous benefits for both humans and the environment, it is not without its challenges. Addressing these challenges requires a nuanced understanding of the complex interplay between economic interests, ecological concerns, and societal values, as well as sustained commitment to long-term planning and implementation efforts.

Chapter 6. Conclusion

Throughout this thesis, the main research question of how the enhancement of nature's plannability in urban environments could align with the integration of an ecosystem-based planning approach into Danish planning praxis, has been explored from different aspects and perspectives. In the literature review, the main research question has been explored in regards to what ecosystem-based planning is, what urban ES are, and what rationalities there exists for using ES and biodiversity in policy discourse. An understanding of an urban ecosystems-based planning approach was developed and presented, which then laid the foundation for the conceptual framework, showing the proposed relationships with the concepts explored in the literature review. It was proposed, that using an urban ecosystems-based planning approach would provide more biodiversity in realized plans, rather than using 'conventional' – in a broad sense – planning approaches.

Using critical realism as the philosophy of science guiding this thesis, the wicked nature of urban planning problems was acknowledged, highlighting the importance of utilizing a holistic approach to planning problems. This entails that not only the planning problem itself must be considered, but also the structures it exists within must be considered. Furthermore, actors who have an agency to change these structures must also be included in these considerations. Through an analytical framework, which was expanded with the formulation of three empirical questions, the municipality of Aarhus and their approach to planning for ES and biodiversity was elucidated with a specific focus on newer policy and planning measures. Firstly the ambitions and focus areas of the aforementioned was uncovered, and secondly the three concrete planning initiatives of Aarhus Ø, Vesterbro Square and Frederiks Avenue were explored, tying the abstract ambitions to the practical dimension. It was found that an urban ecosystems-based planning approach, or the like, was already heavily underway in the municipality of Aarhus. Specifically a focus on the added values an increase of biodiversity and focus on ES has in both the open country and urban environment was immensely prevalent.

However, as was uncovered in the discussion, a systemization of the approach is unlikely, as many shortcomings of the approach needs to be addressed. First and foremost, structures that it cannot control, such as political and citizens support to such an approach, needs to be addressed. As it is right now, the focus on increasing green areas and promoting green mobility in the municipality of Aarhus is as fragile as the political will following the next municipal election.

Secondly, a new common understanding of what is valuable, what constitutes desired growth, and by proxy what is profitable needs to be formulated. Citizens, politicians, developers, associations, organizations etc. need to all agree on a common ground, what is desired for the future of the municipality. From the perspective of an urban ecosystems-based planning approach, this would be acknowledging the hierarchical relationship between ecosystems, human culture, and economy. That healthy ecosystems are necessary to achieve healthy, sustainable and resilient cultures and economies.

Addressing then the main research question, as was included in the opening of this chapter, aligning natures plannability in urban environments in partial leads to an urban ecosystems-based planning approach. Or just ecosystems-based planning. Throughout this thesis, the understanding of ecosystems-based planning has been expanded upon into its own 'sub' category of urban planning in a Danish context. Urban ecosystems-based planning is thus an approach that focuses holistically on the wider structures, that shape the physical environment and contribute to sustainable, resilient and liveable cities. It acknowledges that it is not only the introduction of green areas in urban environments, and the connections to wider natural reserves in the open country, but just as well how people live their lives and the structures and institutions that enable humans to live sustainably, within the planetary boundaries, and with an awareness of what ES does for our continued survival and well-being.

6.1. Further research

This dissertation for the master's programme of Urban Planning & Management at Aalborg University has focused on trying to tie ecosystems-based planning into a Danish context. In the project period it was found that the ecosystems-based planning approach would not fit one-to-one within a Danish context, if it was not supplemented by additional theories on urban ES and a placement of it within the Danish planning regulation. Therefore, this thesis has had a somewhat general perspective on principles, rationalities and concepts, that need to be introduced to adopt this approach. However, using this broad perspective, a very relevant area relevant area has been neglected. As the thesis takes its point of departure largely in downtown Aarhus, where it is densely populated with tall buildings, suburbs and smaller towns have not been considered to their full extent. It is unreasonable to ask everyone to live the same way in small apartments in the city, and this is not to say near impossible to get any political goodwill, so further research could take its point of departure in these dynamics.

Additionally, it is recognized that the urban ecosystems-based planning approach is very rudimentary and includes many bromides. Using the discussion, the possible shortcomings and challenges that need to be addressed have been uncovered, which could lay the foundation for further research or a further development of the framework.

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Appendices

Appendix A Bente Lykke Sørensen

A.1 Interviewguide Bente Lykke Sørensen

Tid: 25.april 2024 kl. 10:30 – 11:30

Sted: Rådhuset, Sønder Allé 2, 8000 Aarhus

Formaliteter:

- Må jeg optage interviewet?
- Vil du anonymiseres?
- Vil du se transkriberingen igennem?
- Vil du gerne have tilsendt de dele, du er citeret/bliver brugt fra rapporten?

Introduktion til projekt

Tema 1 – Planstrategi 2023

- I jeres nyligt vedtagne planstrategi ligger I op til at arbejde i blå-grønne netværk, hvad menes der helt konkret med dét?
- Hvad er baggrunden for at arbejde med såkaldte 'vilde problemer'?

Tema 2 – Grøn Byudvikling

- Hvordan ser du byens rolle i den grønne omstilling?
- I løbet af de sidste par år er flere ambitiøse tiltag ift. Grøn byudvikling blevet fremlagt, herunder Vesterbro torv og lukningen af Frederiks Allé, hvad er baggrunden for dét? Og hvordan ser du realisérbarheden?
- Når I benytter jer af det grønne – altså natur – i jeres nylige byudvikling, hvorfor da? I planen for Vesterbro Torv henvises bl.a. til klimatilpasning via vandafledning, hvorfor ikke bare større kloaker?

Tema 3 – Aarhus Ø

- Aarhus Ø bliver af mange nævnt som når byudvikling går galt, hvordan ser du på dét?
- I de originale planer for Aarhus Ø var der stort fokus på de rekreative og grønne forbindelser – hvordan kan det være det endte som det gjorde på Pier 2 og 3?

Hvad gøres der konkret for at få mere grønt på Aarhus Ø?

A.2 Themetization

Timestamp period	Summary
Formalities	
[00:00.000 --> 00:49.480]	General introductions and matching of expectations.
Introduction to thesis	
[00:50.200 --> 03:20.760]	Introduction to thesis subject and matching of subject vocabulary.
About Bente	
[03.21.060 --> 05:13.280]	About Bente Lykke Sørensen, her qualifications and relation to the subject.
Planning Strategy 2023	
[05:13.680 --> 10:37.580]	The conversation discusses Aarhus Municipality's planning strategy adopted in February 2023, focusing on incorporating blue-green networks and adopting a systemic approach to urban planning, both within and outside the city. The strategy aims to strike a balance between urban density and green spaces, recognizing the importance of nature within the city for sustainability and quality of life. This approach aligns with broader discussions about creating greener cities and addressing urban challenges through innovative planning solutions. Additionally, the strategy extends beyond the city limits, considering the surrounding region's landscape and connections. By involving neighboring municipalities and considering regional factors, Aarhus aims to create a more holistic and interconnected approach to planning. The conversation also highlights the concept of "wicked problems," where traditional solutions may not suffice. Aarhus Municipality identifies several such challenges, including those related to climate, social sustainability, and urban development. By addressing these complex issues, the municipality seeks to engage various stakeholders and break down silos within the organization, fostering collaboration across sectors and involving citizens in the planning process.
Green Urban Development	
[10:37.580 --> 18:46.580]	The discussion delves into Aarhus's role in green urban development, highlighting its historical shift from industrial zones to more environmentally conscious and livable areas. It emphasizes the global trend towards urban living and the consequent demand for urban amenities that enhance quality of life, such as green spaces. There's a notable debate regarding the balance between green spaces and mobility infrastructure like roads, exemplified by projects such as the closure of Frederiks Allé and developments around Vesterbro Torv. These decisions are complex,

	involving considerations of sustainability, livability, and urban aesthetics, and are subject to ongoing political processes and public discourse.
Aarhus Ø	
[18:46.580 --> 33:06.580]	The conversation delves into the development of Aarhus Ø, particularly focusing on Pier 3 and its integration with the city. Initially conceived as part of Aarhus' strategy to attract international investments and talent, Aarhus Ø has evolved into a mixed-use urban area, accommodating diverse segments of society. Recent efforts have emphasized the inclusion of green spaces, reflecting changing preferences and needs. Pier 3's planning involves extensive citizen engagement to determine its purpose and features, with a focus on balancing urbanization with livability. There's consideration for Pier 3's connectivity with the rest of the city and its integration into the broader urban fabric. The discussion highlights the challenges of maintaining a balance between density and quality of life, with Pier 3 being planned for a lower density compared to Pier 4. Despite concerns about isolation, the area sees significant foot traffic, indicating its growing popularity and integration with the city center.