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CHANGING WATERSCAPES AND CATCHMENT NEIGHBOURHOODS IN THE URBAN LANDSCAPES OF THE ANTHROPOCENE
Connecting municipal planning levels with waterscapes and atmospheres through a landscape-strategic approach

KATRINA WIBERG

Abstract
This essay takes the stance that in the Anthropocene the dichotomy between city and nature is called off, and that the uncertainties caused by climate change make our current landscape practices in municipal planning due for reconsideration, with emphasis on processes and connectivity, scale and long-term ecological perspectives. The following employs water and atmosphere as an entry point to how we *see* and sense urban landscapes and to inform a planning practice occupied with land use and function. As an interconnected matter at Earth's scale, going from subsurface to the lower atmosphere, water offers the concept of catchments as earthbound demarcations that can tap into contemporary planning, integrating dynamic and atmospheric qualities. The following explores a revitalized connection between water and planning through the concept of *Catchment Neighbourhoods*[1]. This is done with reference to *design with nature* and ecological urbanism (McHarg, 1969; Mostafavi et al., 2011; Spirn, 2012) and atmospheric implications, drawing on Niels Albertsen's work on cities urbanisation and atmosphere in the Anthropocene (Albertsen, 2021). This is exemplified and discussed through visual analysis from case studies[2] conducted as landscape architectural design research (Lenzholzer et al., 2013; Prominski & Seggern, 2019). The essay departs in landscape architecture and aims to prospect linkages between water-flow and connections offered by the terrains, building patterns, urban development and atmospheres of changing waterscapes.

1 The Catchment Neighbourhood was conceptualized in the author's PhD-research (Wiberg, 2018).
2 The case studies were conducted during the authors PhD research 2013-2017 and the research project Missing Link – when the waters meet in the city, conducting two case studies in Danish cities 2020 (Wiberg, 2022; *Missing Link—Når vandene mødes i byen*, 2020).

Keywords:
climate adaptation, water, atmosphere, urban landscapes in the Anthropocene, landscape architectural methods, planning, Catchment Neighbourhoods

1 Introduction

1.1 Structure

Focus and form of the essay.

The essay focuses on *climate adaptation* (CA) to changing waterscapes in the urban landscapes of the Anthropocene. This is approached by investigating relations between terrains and water-flows, urban development and geographic boundaries of Danish planning and how these attaches to meteorological and aesthetic atmospheres.

Section 1 introduces the theme, the objective, methods, theoretical foundation and assumptions of the essay. Section 2 provides a contextualisation, starting with a short introduction to selected key principles in contemporary Danish municipal planning and the Danish Climate Adaptation Plans, followed by a brief historical perspective on ecological approaches. This is then related to waterscapes and catchments. Section 3 specifies the concept of Catchment Neighbourhood followed by examples from four Danish case studies. Section 4 offers a reflection and conclusion.

1.2 Climate change and water as cross-scale actors

From global to local waterscapes

Climate change in the Anthropocene entails changing waterscapes at the Earth's scale, signalling uncertainties that influence our living and settlement practices. Concurrently, population growth and increasing urbanisation further question human landscape practices. Additionally, impervious surface cover often accompanies urbanisation, sealing off waters above surface and subsurface connections. In a Danish context, changing waterscapes caused by climate change are projected as sea-level rise, increase in storm surge- and cloudburst events and heatwaves. Furthermore, the groundwater table in coastal areas is rising too, as it follows the relative level of the sea. With Denmark having 8,750 kms. of coastline and a considerable number of coastal cities and settlements, the Danish built environment is vulnerable to flooding. With climate change, the water's impact from underground, the sky, the sea and the hinterlands (larger catchment) is becoming more tangible. Scale-wise, this tangibility is fundamentally cross-scale in its implications, vertically from the subsurface to the lower atmosphere and horizontally from the very local to the regional, continental and global. For example, the flooding of a private basement that is caused by water from the larger river catchment at a regional scale, is influenced by temperature increase at a global scale and a sea-level rise influencing the groundwater level.

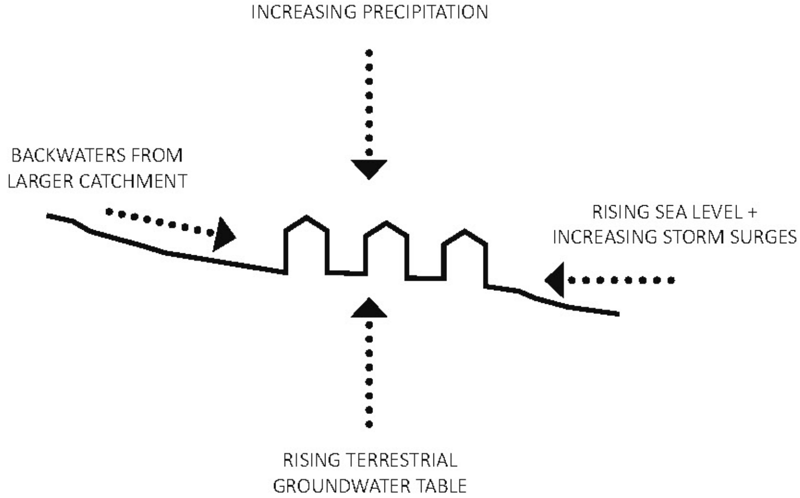
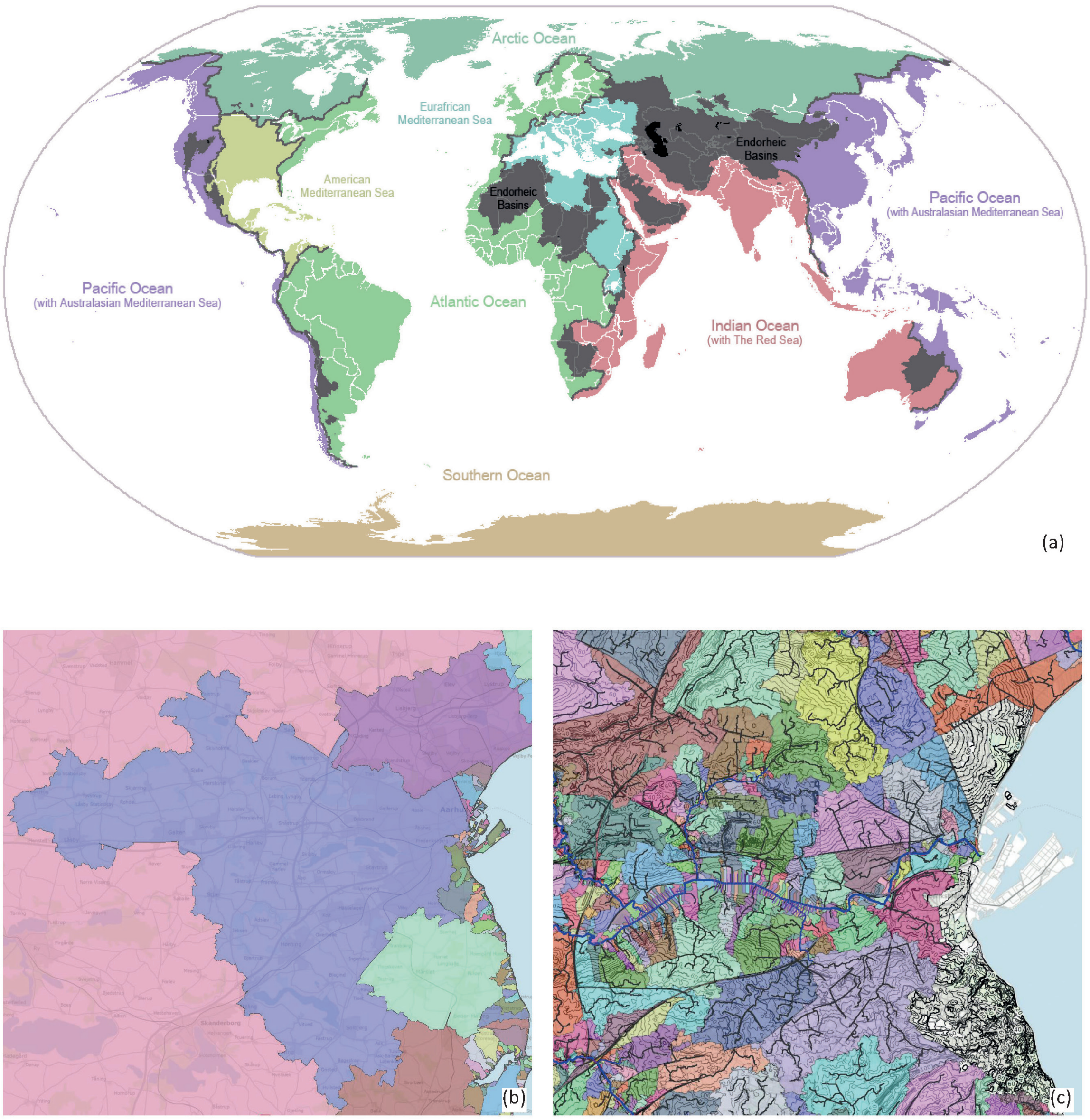


Figure 1.2.1 (left)
360° water. Climate change increases water from all sides in Danish coastal cities; the sea, ground, sky and hinterlands, and the sensed threat may influence the aesthetic atmosphere.
Figure 1.2.2 a, b, c (below)
Drainage basins and catchments are cross-scale, interconnected systems from the scale of Earth to the very local. (a) worlds drainage basins, major oceans and seas of the world.
Credit: 24 January 2007 (original upload date), transferred from en. wikipedia to Commons. Author: Citynoise at English Wikipedia.
(b) Larger catchment of Aarhus, (c) watercourse system, flow-paths and sub-catchments.
Credit: Scalgo 2020.11.29.



Climate change, uncertainty and planning in the Anthropocene

With climate change, urbanisation processes and contemporary material practices entailing a critical loss in biodiversity and risks of ecosystem collapses, time is up for rethinking human landscape practices. As the changing climate warrants a moving target, planning practices also need to embed dynamic and processual elements. However, despite sustainable urban development intentions, Danish municipal planning has a missing link between the city's vision, planning levels and urban development: There are no water-wise, cross-scale linkages between the different planning levels or attachment to deep structures (Wiberg, 2018). The uncertainty of climate change and changing waterscapes represent a wicked problem with no fixed or single end solutions. Thus, according to Rittel and Weber's thinking, they are suitable for multidisciplinary knowledge and designerly thinking (Rittel & Webber, 1973; Wiberg, 2018, p. 69). From this stance, it seems reasonable that methods from design research could contribute to knowledge creation on the question of how municipal planning and landscape practices of urban development can embed dynamic and cross-scale processual elements in the urban landscapes of the Anthropocene.

1.3 Theoretical and methodological foundation

Aim and objective

The following takes a propositional approach by employing concepts and learning from Danish case studies conducted by the author during 2013-2020. The essay mainly draws on two concepts that were investigated in the research project *Missing Link – when the waters meet in the city* (Wiberg, 2022; Wiberg et al., 2021; *Missing Link—Når vandene mødes i byen*, 2020); (a) Waters' Cityatlas and (b) Catchment Neighbourhood[3]. In Missing Link, the concept of Waters' Cityatlas (referred to from now on as Atlas) was used to explore visual ways to render the often invisible relations between the deep structures of the terrain, water-flows and the built environment. In this sense, the Atlas was used as a method and visual medium to explore relations between deep structures, water, urban settlement patterns and planning boundaries. The concept of Catchment Neighbourhood was used as a pragmatic, practice-oriented concept, seeking to connect different municipal planning levels and the notion of neighbourhoods via their shared topographic catchment. The objective was to explore how to provide municipal planning with gradient, processual views on spatial qualities, atmospheres and flows of human and non-human actors at an interpretational and practical level.

3 (a) Vandets Byatlas (b) Oplandskvarter

Methods – case studies via field, visual analyses and Design Comments

The Danish case studies were conducted using landscape-architectural research through designing methods (Lenzholzer et al., 2013; Prominski, 2005; 2015; Seggern et al., 2008), emphasising methods of visual analysis based on embodied knowledge through field observations, mapping, photography and diagramming. These methods were accompanied by "Design Comments" (Wiberg, 2019), which uses tangible materials such as mapping as a core for creating dialogue and knowledge exchange between actors from different disciplines. The visual analyses were employed to cross-reference different types of knowledge. The tangible material used in Design Comments, visualised a palette of different types of knowledge rendering cross-scale connections between the larger catchment and sub-catchments in urban landscapes, cross-temporal relations between knowledge drawn from historical maps and contemporary maps together with spatial and atmospheric qualities in photographs and sensed via own aesthetic experiences in the field. These visual representations of hybrid data combined soft and hard facts such as historical knowledge of terrains and waterscapes, projections on future flood-risk, GIS-data on the surface cover, the function of buildings, onsite analysis of spatial qualities and aesthetic experiences of the existing contemporary urban landscape. Altogether, this formed the foundation for exploring and prospecting change in practices in contemporary municipal planning with attention to connecting planning with processual approaches and act with water as cross-scale atmospheric matter in the Anthropocene's urban landscapes.

Design with nature and ecological urbanism

To contextualise the acclaimed need for integrating processual and dynamic elements in planning, the employed case studies – as well as the discussions in this essay – build upon methods, learning and theories from "Design with Nature" and ecological urbanism (McHarg, 1969; Mostafavi et al., 2011; Prominski, 2005; 2014; Spirn, 2012; Waldheim, 2016). Notably, the following have been informed by the methods of Ian McHarg and the work of Anne Whiston Spirn, and her guidance for the reading landscapes, coined by her term landscape (il)literacy (Spirn, 1984; 1993; 1998; 2012). The essay also draws on work by Niels Albertsen (2020a; 2020b; 2020c; 2021), engaging atmosphere as aesthetic, sensuous experiences of water and water as an atmospheric matter. The following addresses atmosphere in its literal, meteorological sense, as climate change in the Anthropocene will critically entail changing waterscapes and thus also impact the aesthetic experiences of water in urban landscapes.

Changing waterscapes and atmospheres in the urban landscapes of the Anthropocene

> *Living in cities means living sensuously in and with the environing urban atmospheres* (Albertsen, 2021, p. 5).

The following draws on political scientist and sociologist Niels Albertsen's work[4] on cities and atmosphere in the Anthropocene (Albertsen, 2020a; 2020b; 2020c; 2021). Albertsen explains a difference between atmosphere as an aesthetic experience and atmosphere as a meteoro-

4 The reflections on atmosphere in this essay owe gratitude to Niels Albertsen and his generous conversations on water and urban landscapes in the Anthropocene.

logical (natural, physical) phenomenon. The following draws on this distinction, with attention to Albertsen's suggestion that climate change caused by anthropogenic processes possibly makes the distinction between the two less obvious, as knowledge of climate change influences the experienced atmosphere. Albertsen explains how climate change may already affect our sensed perception of atmospheres, caused by an awareness based on knowledge on the implications of climate change. For example, Albertsen describes how the evening sky's sensation in Northern Jutland may be sensed differently when adding knowledge on how the atmosphere contains a (too) high degree of greenhouse gasses and how projected sea-level rise threatens settlements (Albertsen, 2020c; 2021). Changing waterscapes already influence atmospheres in urban landscapes at different levels. More water due to changes in the meteorological atmosphere directly affects our urban landscapes, both in a literal sense of changing weather patterns, such as increasing extreme rain and droughts, and physical transformations of areas due to more water. Furthermore, we might sense flood-prone built areas differently. For example, a change in atmosphere caused by new structures such as retention basins, integration of more vegetation via rain gardens, a sense of potential threat of flooded homes, a sense of empowerment having local mobile solutions at hand, likely visible in the streetscapes, the sense of the touch and sound of heavy rainfall or the mirroring in the pools after the rain.

Figure 1.3.1
Changing waterscapes and atmospheres of water in urban landscapes.
(a) Copenhagen 2014. The underground water returns, changing the aesthetic atmosphere of the streetscapes after a cloudburst on 30th August 2014.
Credit photo: Caroline Nygaard.
(b) Kolding 2020. Temporary protective elements change the streetscape atmosphere in Kolding, implying water as a threat.
Credit photo: Photographer Kim Vedebech.
(c) Venice 2019. An atmosphere of integrated water and preparedness in the streets of Venice.
Credit photo: Kari Moseng.
(d) Odense 2020. An atmosphere of varied vegetation as a subtle indicator of integrated water management.
Credit photo: Wiberg

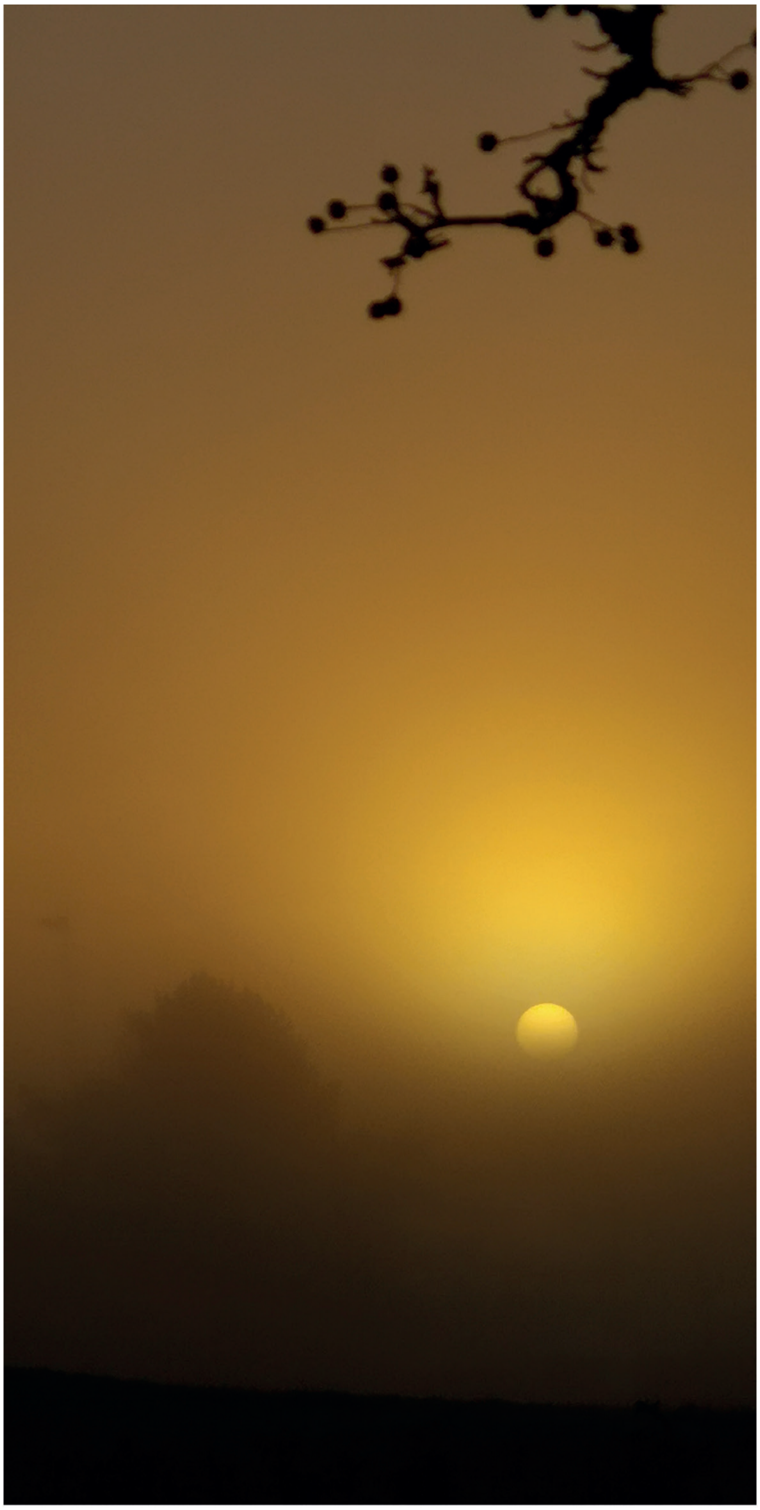


Figure 1.3.2
Misty morning in St. Magleby, November 2020. Water as meteorological atmosphere and aesthetic atmosphere – a physical and atmospheric matter in flux. For example, water as vapour forming clouds, evapotranspiration through the leaves of trees, infiltration of pervious surfaces and fluid movement on surfaces or inside hidden underground networks. Water continually changes its state and freely crosses human-set boundaries. It moves through the human body and other living species forming an integral part of vegetation, animals, fungi and microbes, while also moving the finest grained sediments and pushing bedrock in its solid-state as ice, like mist in its vaporous state and in the form of watery rocks in the mantle of Earth.

Assumptions – a need for spatial retrofitting and changing practices influencing atmospheres

The following proposes that water, as an interconnected system with implications at all geographical scales from the very local to global, can play a revitalised, essential role in how we see, plan and transform urban landscapes. Furthermore, water as an atmospheric actor in both a meteorological and aesthetic sense can inform changing practices. From this stance, water represents vital importance and risk, forming a potential to include an atmospheric actor into the planning system as more than an amenity. Integrating water at a processual level does not only provide opportunities for diminishing flood risk. As water is a physical and interconnected matter, it requires space and connectivity. This attaches to potentials for increasing biodiversity, soft mobility and social cohesion, which also require space and connectivity – not to mention potentials for sensuous qualities.

The following uses waterscapes and flood risk as a pivotal point to discuss the dichotomy between urban development and associated flood risk, versus how we sense, read and make our urban landscapes – employing water as a critical, non-human actor crossing the different planning levels.

This essay assumes that: (a) climate change and adaptation to changing meteorological atmospheres require reconsideration of our landscape practices and how we "see", sense, understand and plan our urban landscapes, (b) resource scarcity and mass extinction of non-human actors calls for careful consideration of materials that we have already altered and brought into our urban landscapes (the existing built environment), (c) the above (a and b) represents a need for spatial retrofitting and processual understanding of our built environment to accommodate more water and changing waterscapes, which will influence the aesthetic atmosphere with or without adaptation.

2 Contextualisation

2.1 Water and Danish planning in the Anthropocene

Cloud-burst events and the Danish climate adaptation plans

Climate change adaptation of urban landscapes has to refer to changing waterscapes as a core issue, which is also the case in the Danish Municipal Climate Adaptation Plans. However, the focus on water may be too narrow in its scope to accommodate flux, cross-scale connections and the level of uncertainty over time caused by human-induced climate change. In Denmark in 2013, the state and the Municipal Association (KL[5]) agreed on instigating mandatory Climate Adaptation Plans focusing on risk assessment and flood risk. The agreement was based on climate change prognosis and experiences from a severe cloud-burst in 2011. However, the relation between the *climate change adaptation plans* (referred to from now on as CA plans) and the Municipal Plans shows an inconsistency between the different planning levels. The cross-scale interconnectivity of waterscapes is not fully integrated between the municipal planning levels, such as the main structure, vision[6], sector plans,

5 Kommunernes Landsforening

6 "Hovedstruktur" and "vision"

urban development plans and local plans (Wiberg, 2018, p. 546). Climate adaptation is often initiated with a departure in projected flow-paths and blue spots, risk maps and value maps shown in the CA plans. At the same time, new urban development plans tend to focus on the local handling of water without addressing the connectivity of water-flows at a more extensive, geographical scale.

One of the consequences is a discrepancy between visions of "the good future city", the planned and the built, and water-flows in a cloudburst event. For example, case studies in the author's thesis showed how climate adaptation was initiated in one area, while new urban development plans further downstream would increase flood risk somewhere else, or be located on low-lying, former wetlands (Wiberg, 2018).

In Danish municipal planning, water and catchments are mainly addressed in sector plans such as the Wastewater Plan, addressing, e.g., sewer catchments and topographic catchments. However, the Wastewater Sector Plans are not used for decision-making in urban development, besides water and sewage management at a technical level. The continuous, ongoing restoration and retrofitting of the city's existing areas are not related to catchments either. The Climate Adaptation Plans tend to focus on surface water with attention to hot spots, local water handling and high entrance levels for buildings at new harbourfront developments.

A planning of static boundaries and linear thinking – a disconnection between urban development and its terrains

Even today, former floodplains, wetlands, streams and primary flow-paths are built upon; disconnecting the flow of water diminishes space for water while also using considerable amounts of impervious surface cover. As a recent example in Aarhus, the former brownfield in the low-lying river valley was designated for a change in function, giving way to a new, compact city, filling up the river valley. Thus, the filling up with new buildings neglects the area's characteristics of a wetland and its integration in the larger catchment. Such contemporary practice of neglecting terrain and water as a cross-scale actor comes with implications for the surrounding and downstream areas, potentially inflicting additional flood risk. From this perspective, one could argue that (a) contemporary urban development and planning represent a thinking and making that does not take the Anthropocene era and its changing waterscapes into consideration and (b) that water's cross-scale connections and larger connectivity of terrains is secondary to contemporary planning.

Figure 2.1.1
New urban developments in Aarhus River Valley. The former wetland has been collecting, storing and passing water for millennia. The current urban development fills up the area above and sub-surface. The density leaves little room for water and other species other than humans. The compactness and materiality give an alienating atmosphere. Photo: Wiberg, 2021.

Good intentions in municipal planning

> *In urban development, we first need to make it clear how an urban or rural area is used best – whom do we want to use it and how. Then we must design the area – the space – and any buildings so that they contribute to promoting the desired use, the desired life. In short, we must think urban life before urban space and urban space before buildings. (Author's translation[7]). Aarhus Municipal Plan 2017, p. 78, "Værktøjer til realisering i planlægningen"* (Aarhus Kommune, 2018). Authors' translation.

The above introductory quote is from "for tools used in the realisation of the municipal plan", Aarhus Municipal Plan 2017. The quote exemplifies how good intentions in municipal planning seem deeply rooted in anthropocentric thinking of human control of its surroundings. The quote refers to strategies for liveability. However, spaces and areas are described in a purely functional manner, ready to divide into administrative boundaries of the desired functionality. This can be seen as a landscape practice considering land as areas within a geographic, scale-wise hierarchy where rural or urban areas can be downscaled linearly to plot and building. One could see this as good intentions embedded in anthropocentric thinking, disconnected from tangible and intangible qualities such as water and atmosphere.

The Danish Municipal CA Plans derived from occurrences of extreme rain events in Denmark, which created atmospheres of threat during the flood and an atmosphere of will-to-act afterwards – of course, accompanied by the IPCC prognosis on Climate change (IPCC, 2007; 2014). However, pointing to a disconnection between ecological processes and urban development that causes adverse effects on human and non-human actors is not new. The criticality of human landscape practices has been flagged long before the IPCC reports or the Danish cloud-bursts.

7 "Byudviklingen skal vi først gøre os klart, hvordan et by- eller landområde bruges bedst – hvem vil vi gerne have til at bruge det og hvordan. Derefter skal vi indrette området – rummet – og eventuelle bygninger, så de medvirker til at fremme den ønskede anvendelse, det ønskede liv. Kort sagt, skal vi tænke byliv før byrum og byrum før bygninger."

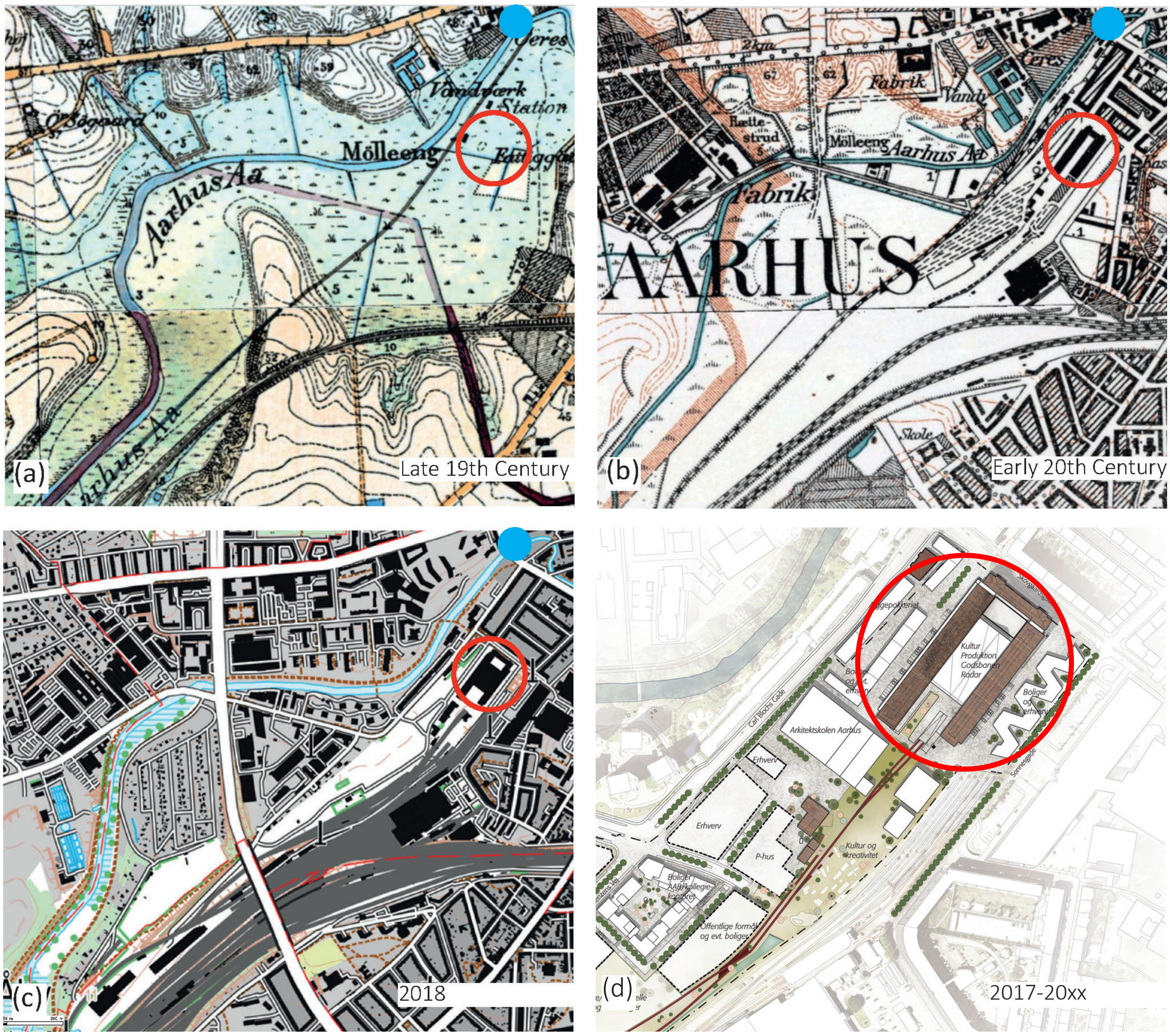


Figure 2.1.2
Urban development from the late 19th Century to the present in the River Valley of Aarhus; from wetland and stream to railway area, to abandoned brownfield to compact city development. The red circle is a geotag. The blue circle shows a contemporary example of building on top of the stream. (a) Near-past land use. Wetland formed by a timescale of 12.000 years. (b) Drained wetland transformed into industrial area on a timescale of 140 years. (d) Present and near future. High density urban development. Source maps: (a) SDFE, Høje Målebordsblade 1842-1899, (b) SDFE, Lave Målebordsblade 1926-1941, (c) SDFE map 2018, (d) Aarhus Kommune Plan 2017, Planstrategi 2015. Maps are at different scales.

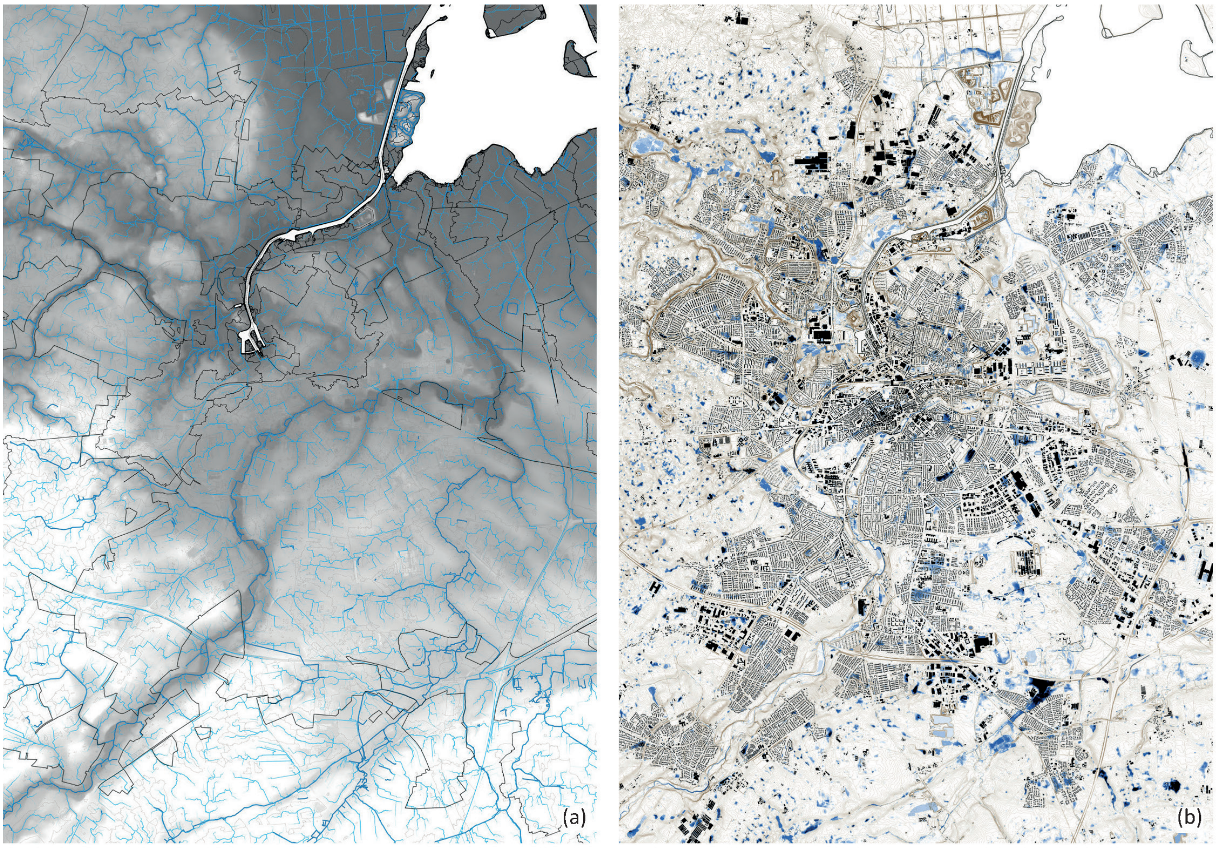


Figure 2.1.3
(a) The map emphasises the deep structures and water-flows in the greater Odense area. The thin black lines show the boundary between rural and urban planning zones. (b) Deep structures (brown contour lines), building footprints and blue spots. The maps point to a discrepancy between the geometric delineations of planning, settlement patterns and the larger-scale interdependencies of deep structures and water.

2.2 Calls for water and ecological approaches in recent history
Two centuries of pointing to urgent needs for ecological thinking and practices

> *But, as we have seen, man has reacted upon organised and inorganic nature, and thereby modified, if not determined, the material structure of his earthly home. George Perkins Marsh, 1864* (Marsh, 1974, p. 13).

With climate change and increasing urbanisation in the Anthropocene, any clear distinction between humans and nature becomes obsolete, and a need for ecological thinking and planning increases. However, pointing to a more holistic, less destructive modus of human landscape practices is not new. In the early 19th Century, scientist Alexander von Humboldt was one of the first to warn against harmful, human-induced climate change (Wulf, 2015; 2017).

Based on his field observations in the late 18th Century Meso- and South America, Humboldt suggested the existence of larger-scale, planetary connections, inventing the idea of isothermal lines spanning the globe and developing a first visual interpretation of these (Robinson & Wallis, 1967).

Humboldt argued that a combination of barometric-trigonometric measurement was more precise than pure trigonometry (Humboldt et al., 2018, p. 369), thus, attaching his field studies to atmospheric observations. His illustrations show the combined methods and powerful visual approach, such as the Chimborazo and Geographie des Pflanzen (Figures 2.2.1 and 2.2.2).

During the 19th Century, awareness of the negative impacts caused by human landscape practices was growing (Geddes, 1972; Wulf, 2017), with some of the proponents developing into the North American Conservationist movement and the rise of North Americas National Parks. For example, George Perkins Marsh pointed out the consequences of human actions and suggested how nature could mitigate harmful human practices (Marsh, 1974; McHarg & Steiner, 2006, p. 13).

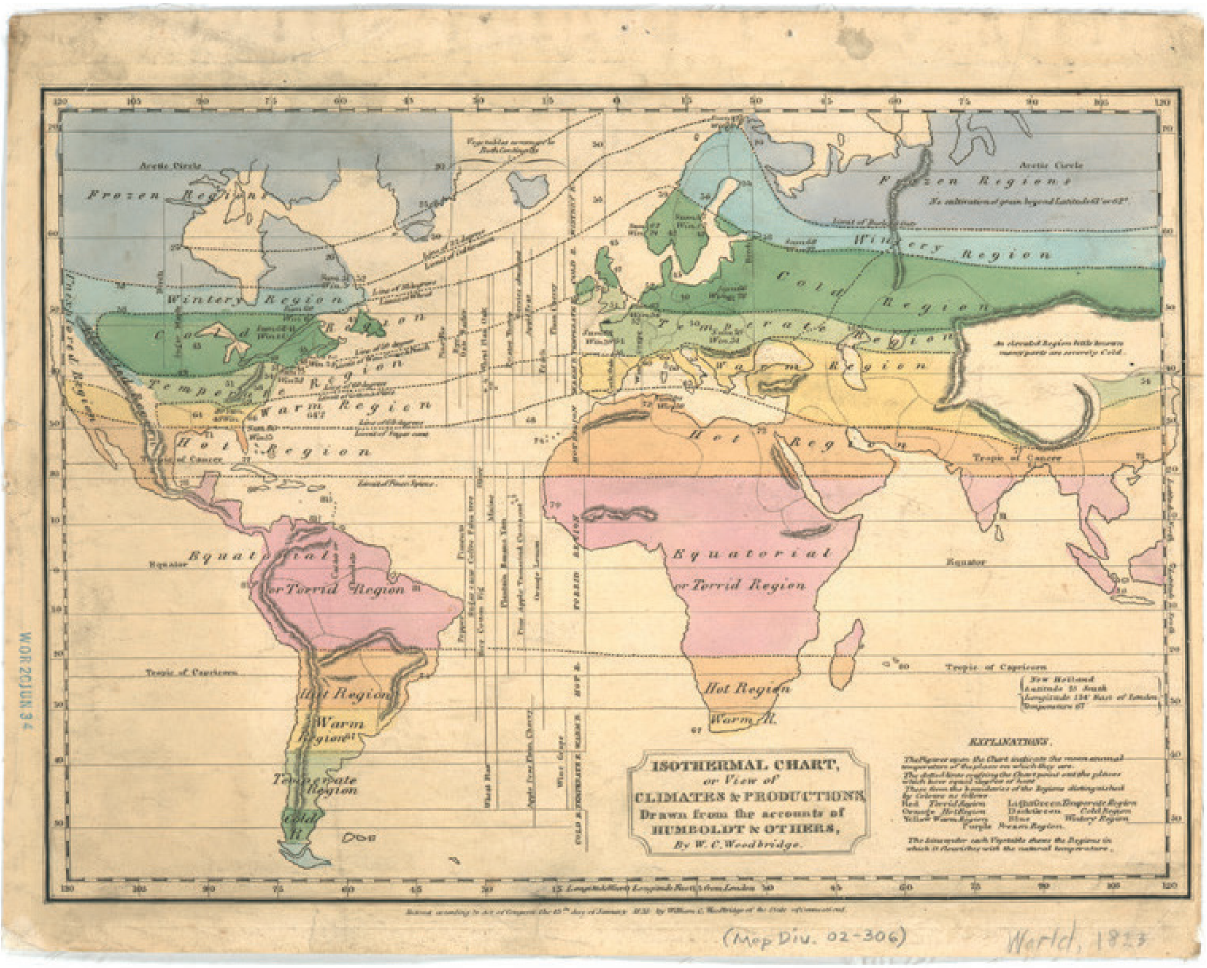


Figure 2.2.1
Map of Alexander von Humboldt's concept of isothermal lines as interconnected Earth systems. Credit: Isothermal Chart or View of Climates & Production in Woodbridge's School Atlas to Accompany Woodbridge's Rudiments of Geography: Atlas on a New Plan. William C. Woodbridge, 1830. Geography and Map Division, Library of Congress.

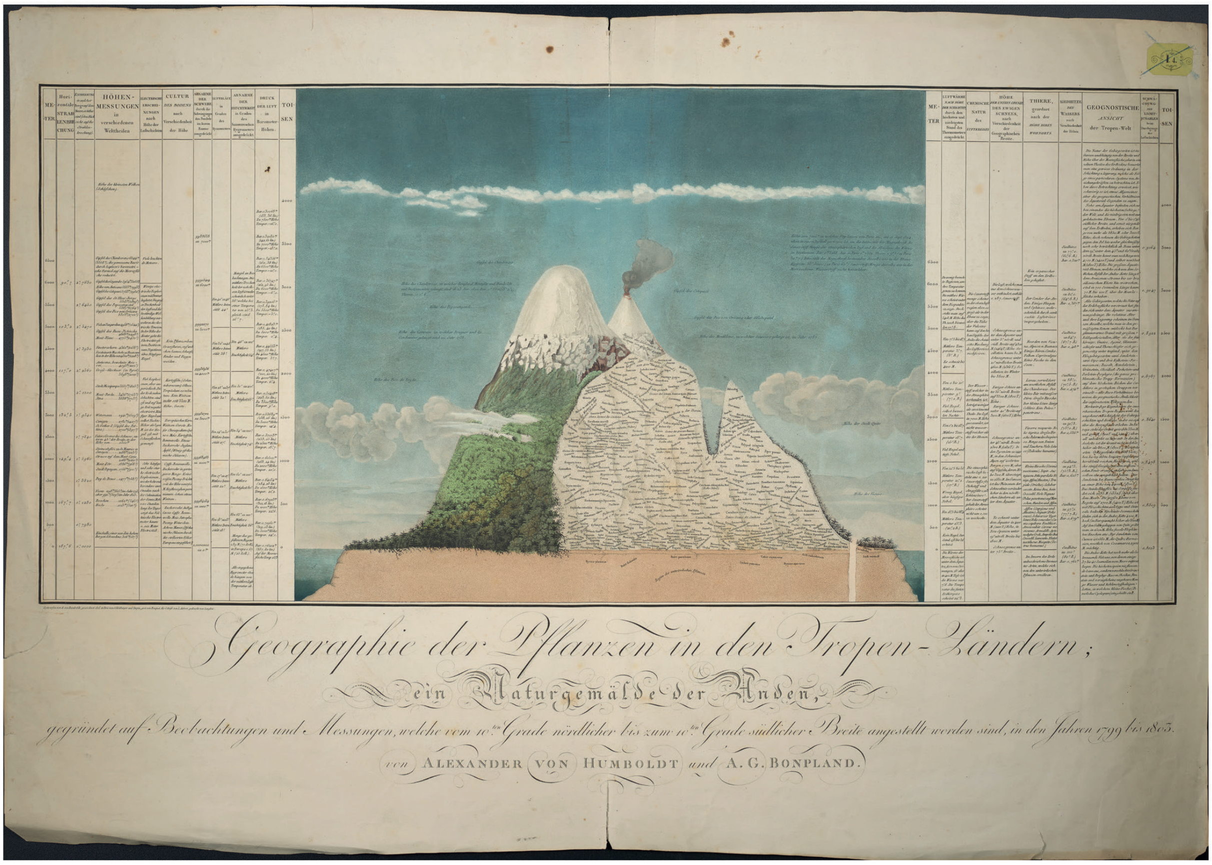


Figure 2.2.2
Illustration of the Chimborazo with a powerful mix of visual techniques to represent data in "Geographie des Pflanzen in den Tropen-Ländern" by Alexander vonHumboldt, 1807.
Source: Leibniz-Institut für Länderkunde, Leipzig, A. von Humboldt (Hrsg.), download Wikimedia.

The ecological inventory and planning methods of the 1960s are proving even more needed today

Since the 1960s and the rise of the environmental movements with their explicit concern on the consequences of human practices, there has been a growing call for integrating ecological thinking in land-use planning and urban development. The most renowned in landscape architecture and planning is probably Ian McHarg and his book, *Design with Nature* (McHarg, 1969). McHarg offered specific mapping methods for analysis and how to design urban development in accordance with the ecological inventory. Over time, his methods became influential to GIS development and the American EIS related to the Danish VVM[8]. McHarg's work presents an example of entanglement between atmospheres and hard-fact knowledge via layered mapping. These methods are proving even more crucial today with climate change. For example, in the 1970s, McHarg used his methods to analyse the ecological inventory of Staten Island. A proposal for settlement patterns followed this. In the aftermath of Hurricane Sandy in 2012, Wagner, Merson and Wentz conducted a study on whether following McHarg's methods and guidelines for urban development at Staten Island would have reduced the damages (Wagner et al., 2016). According to their study, McHarg's methods would have lessened the consequences of Sandy. "While McHarg's study would not have completely avoided damage, the findings of this study show that

8 EIS: Environmental Impact Statement, USA. VVM: Vurdering af Virkninger på Miljøet (assessment of environmental impact).

losses from Sandy would have been substantially reduced had development followed principles of intrinsic suitability and ecological wisdom instead of being driven by economic decisions" (Wagner et al., 2016, p. 43). Wagner et al. do not discuss atmosphere. However, photographs from the area tell of the damages invoked by the meteorological atmosphere and how this completely changed the aesthetic atmosphere of residential areas. Moreover, it was not only a short-term event during the hurricane but has taken years to recover, which, again, most likely influenced the aesthetic atmosphere. The influence of McHarg and how to design *with* our natural surroundings have for decades been influential among landscape architects and ecologists such as Anne Spirn, Frederick Steiner, Mostahfavi and James Corner (Corner, 1997; Mostafavi et al., 2011; Spirn, 1991; 1993; 2005; 2012; Thompson & Steiner, 1997).

Figure 2.2.3
The aftermath of Hurricane Sandy with destroyed houses on Staten Island, NY.
Credit: I Marine Expeditionary Force
Photo by Cpl. Bryan Nygaard, 6th. Nob 2012, www.dvidshub.net/image/778088/aftermath-hurricane-sandy#, Author DVIDSHUB, https://www.flickr.com/people/28650594@N03

A landscape illiterate urban development

In the 1980s, Anne Spirn guided how to strategically design cities with a departure in Air, Earth and Water in her book, *The Granite Garden* (Spirn, 1984). Furthermore, her long-term work in Mill Creek, Philadelphia from the 1980s and onwards (Spirn, 1991) shed additional light on the consequences of urban development without recognising water and deep structures (Spirn, 2005). Spirn uncovered linkages between natural properties, urban development, poverty and equity. Spirn's case studies and involvement showed deprived areas on a former floodplain in Mill Creek, Philadelphia. This area was struck by floods, sinking roads – and poverty. According to Spirn, its residents even referred to their area as "the bottom". Spirn describes how the residents were literally at the bottom of society and the bottom of a floodplain, to an extent where the residents felt shame, guilt and resignation. Spirn points out that the lack of coherence between the ecological inventory, settlement patterns and socio-economic situations reflected an environmental injustice (ibid.).

Without having been there, the description points to that the combination of flood risk, poverty and inequity must have influenced the aesthetic experience of the area. Atmospheres that can be seen as caused by the meteorological atmosphere of a wet floodplain, in combination with human settlement practices of building in flood-risk areas and leaving it as homes to lower-income citizens. Here, the element of relations between atmosphere and knowledge arises. Spirn coined the *seeing* and reading of landscape as Landscape Literacy, and the lack thereof she coined as Landscape Illiteracy (Spirn, 2005), thus, a skill to be learned (Spirn, 1998). In Mill Creek, Spirn showed how it was a relief to the residents when they learned to read the landscape of their neighbourhood. Spirn's skill of landscape literacy offered a new understanding of the consequences of, unwillingly, living on top of a floodplain, likely relieving the feeling of shame. It seems fair to suggest that the new skill likely changed the perceived atmosphere due to an understanding of the meteorological atmosphere and its deep connection to the aesthetic experience of the urban area.

In a more general perspective, the concept of landscape illiteracy relates to a trajectory that assumes that humans are in control of nature, including water. The 19th and 20th centuries provided significant water control technologies, which were reflected in landscape practices and urban development. In many ways, the new technologies of piping, pumping and draining boosted the trajectory of undergrounding water[9]. A side effect was that the reading of landscapes became an obsolete skill in urban development. However, in the Anthropocene, with human inflicted climate change, the lack of landscape reading and the assumption of control strikes back as flood-risk in urban landscapes. From this perspective, contemporary human landscape practices enforce flood-risk atmospheres in a cloud-burst or storm-surge, due to a neglected capability of reading landscapes and integrating processual and atmospheric elements in planning and urban development. In a historical context, a division of land and the location of buildings that neglect the terrain and water has not always been the practice. Contemporary practices of land division in planning and ownership could be seen as a well-established but rather young practice of a few hundred years, which gained pace from the 1960s and onwards.

9 waters command and control regime

Water, landscape practices and division of land in recent Danish history

> *As early as in the 15-16th Century, it was noted in the regional descriptions that the watercourses were used as divisions. The medieval Landscape Laws were occupied with the complicated division-problems that occurred when a stream changed its course naturally.* (Porsmose et al., 1990, p. 20), author's translation[10].

Formerly, when Denmark was an agricultural society, the land's functional and administrative divisions were often related to access to resources. The villages' locations reflected landscape properties such as slope, soil conditions, streams, orientation, humidity and passability. In Denmark, water formed essential criteria in defining the parish boundaries, which tended to follow catchments or two half-catchments so that the local stream was shared between parishes. Within the catchment, the villages had a formalised structure for allocating different types of pastures and fields, often sharing a *fælled* (commons). Landscape as a

10 "Allerede I 1600-1700-tallet noteredes det i egnsbeskrivelser, at vandløbene overalt ydnyttedes som skel. [...] Allerede de middelalderlige landskabslove beskæftiger sig med de indviklede skelproblemer, der opstod, når et vandløb skiftede leje på naturlig vis" (Porsmose et al., 1990, p. 20).

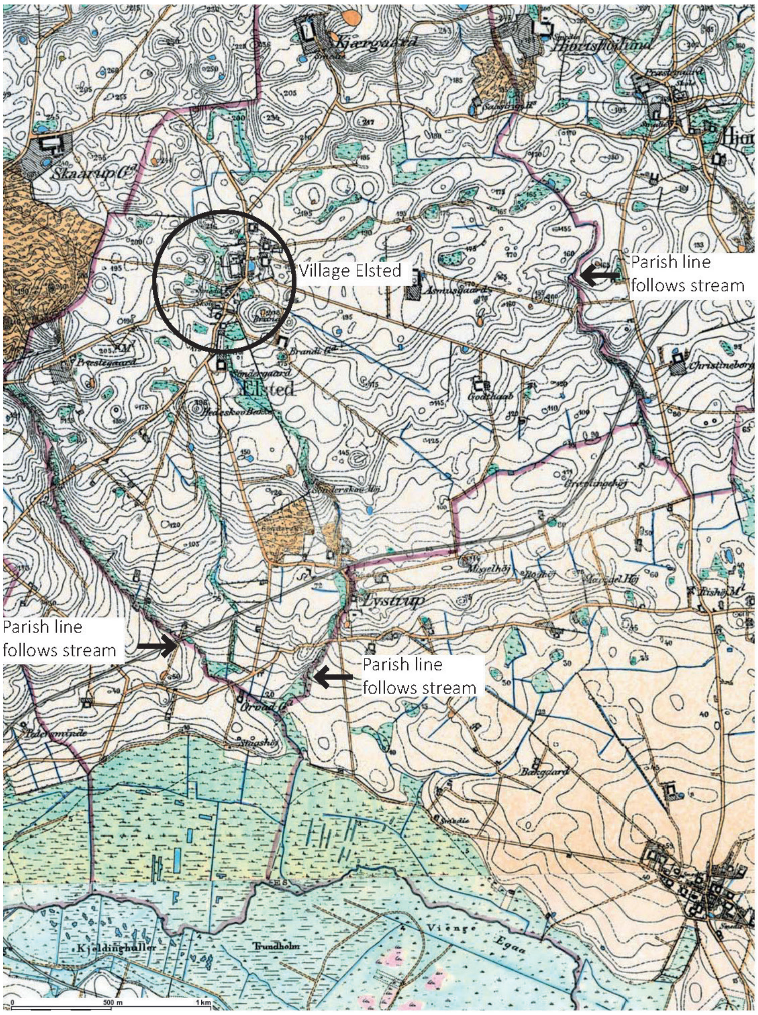


Figure 2.2.4
Sharing resources through land-use division following the landscape and waterscapes. The historical late 19th Century map shows the parish lines (purple) of the village Elsted.
Credit: Høje Målebordsblade 1842-1899 SDFE 2020.08.30.

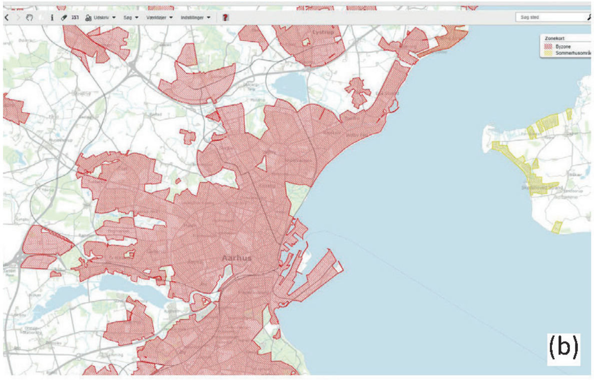
practice informed land use and the division of land. The remnants of these practices can still be traced on the historical maps from the late 19th Century (Høje Målebordsblade). For example, structures pointing to interconnectivity between land-use, settlement patterns and appertaining waterscapes (Bjørn & Landbohistorisk selskab, 1988; Bredsdorff et al., 1973; Olwig, 1984; Porsmose, 2008). These historical and well described landscape practices inform the proposition of the Catchment Neighbourhood.

Anthropocentric thinking and making

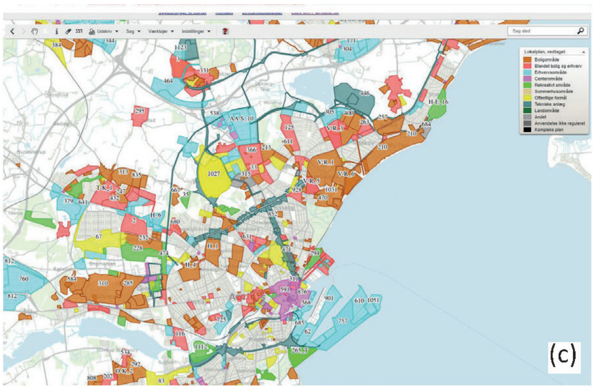
This essay takes the stance that contemporary planning in Denmark reflects a more general trajectory of anthropocentric, utilitarian thinking in planning, which translates into static, administrative denominations of land-use. For example, land-use within the three zoning categories of urban, rural and recreational houses (in the Danish Planning Act) with sub-divisions into planning classes, e.g., residential, industrial or mixed-use and further divided into cadastres. The modus resembles CIAM's early 20th Century land-use categories as seen on the maps in The Functional City (Es & Chapel, 2014): a functional, utilitarian division of land according to human needs. Admittedly, Danish planning also provides non-utilitarian zoning[11], such as archaeological, coastal and forest protection zoning. However, such zonings tend to be delineated by generic, off-set geometries that do not integrate cross-scale, processual, spatial or atmospheric considerations.

11 Bygge- og beskyttelseslinjer, naturbeskyttelse og fredning.

a) Layers: screen map, beach protection, protected earth- and stone mounds, church no-build-zones, forest-, stream and lake protection zones



b) Urban and rural zoning



c) Confirmed local plans

d) Sediment and soiltypes

e) Flow-paths

Figure 2.2.5
Zone delineations. (a) The off-set geometries of protection lines (beach protection, earth and stone mounds protection, church-no-build-zones, forest, stream and lake protection zones). (b) Urban and rural zone, (c) Confirmed local plans, (d) Sediment and soil types (e) Flow-paths. The geometric zoning in maps (a-c) contrast the rhizomatic systems of maps (d-e), showing disparate logics between water and terrain and the planning boundaries of an area. Maps are not in scale.

Credit: (a-c) SDFE, Plandata 2020.11.29, (d-e) Kystatlas and Scalgo 2020.11.29.

2.3 Waterscapes and catchments
Watersheds in urban and metropolitan areas

> *The breadth of constituencies and professions that can use watersheds presents a pathway for linkages between planning and design and ecological science. Dr. S.T.A. Pickett, an expert in urban ecology, quoting landscape architect Anne Whiston Spirn* (Pickett et al., 2004, p.376; Spirn, 1984).

Ecologist S.T.A. Pickett argues that it is essential to recognise urban and metropolitan areas as ecological-social systems with spatial heterogeneity, as a linkage between planning and ecology (Pickett et al., 2004, p. 369, 372–373). Water and watersheds are foundational in ecosystems, urban ecology and discourses on resilient cities. Ecologists Pickett et al. explicitly point to the importance of catchments, their potentials and how ecological functions can be used in design and planning (Pickett et al., 2004, p. 376), including a broad field of management and policy aspects (Pickett et al., 2014, p. 151). Topographic catchments are dynamic, processual and interconnected, horizontally demarcating geographic boundaries, with the same water vertically connecting the subsurface and the surface of Earth with the lower atmosphere. Also, Latour draws attention to watersheds when coining the term Critical Zones (Latour, 2014), stretching vertically from the lower atmosphere and down to the"dry soil", and horizontally exemplified via catchments. These descriptions refer to atmospheres in a meteorological sense as physical matter, while the horizontal and vertical implications would, necessarily, also embed aesthetic atmospheres.

Waterscapes and Catchment Neighbourhoods in planning

Water is vital to life and, obviously, a dynamic matter in flux with atmospheric qualities. At the same time, water's earthbound demarcations can be integrated into contemporary planning. This essay argues that topographic catchments represent an underused potential in planning, and the following sections explore the concept of Catchment Neighbourhoods. The scale-impact of water does not follow administrative delineations such as the municipal border, the urban zone or local plans. However, all geographical places, including municipalities, cities, settlements and buildings, are *per se* inscribed in watersheds and sub-catchments with functional and atmospheric impacts.

3 Catchment Neighbourhoods and case studies

3.1 The concept of Catchment Neighbourhood
Why connect the terms Catchment and Neighbourhood

The Catchment Neighbourhood conceptualisation attempts to grasp a cross-scale, atmospheric matter at a planning level. *Catchment* represents the integration of water and terrain (both built and natural), capable of geographical delineations known from land-use planning. In this way, catchments can denominate areas like the contemporary, fundamental principles in urban planning, while still addressing different scales via nested sub-catchments. Thus, a catchment approach embeds processes through the constant flux of water. With anthropogenic climate change and changing waterscapes, the atmosphere of catchments changes in both an aesthetic and meteorological sense – for example, changes into too much or too scarce water, changes in vegetation patterns, indications of threat or changing spaces of physical adaptation measures such as retention basins or rain gardens. This means that the meteorological atmosphere will impact the aesthetic atmosphere of urban landscapes regardless of whether we adapt to changing waterscapes or not. The term *Neighbourhood* is used to denominate how territories and networks connect at the local scale as places (Nielsen, 2015) that form part of districts, communities and belonging. In urban development, neighbourhoods are often understood as representing something shared; a similarity such as similar functions, building styles, socio-economic parameters or a shared history.

In themselves, different neighbourhoods are likely to be associated with different atmospheres. In this context, the neighbourhood connects up and downstream relations between human and non-human actors, going beyond building typologies or income. Furthermore, a neighbourhood attached to its water would literally attach the built environment to atmospheric, processual non-human actors.

In the case studies, the concept of *Catchment Neighbourhood* is used as a *"modus operand"* to grasp a cross-scale connection between waterscapes and urban development/planning with atmospheric implications. At a practical level, it is an effort to integrate water as the non-human actor which entangles dichotomies between city and rural, urban and nature, human and non-human in contemporary municipal planning of the Anthropocene. As such, the *Catchment Neighbourhood* aims to conceptualise a water- and landscape-based approach, capable of connecting municipal planning at both tangible and functional, processual and atmospheric levels.

The Catchment Neighbourhood and related concepts and discourses

As described, landscape practices that integrate water are historically well known. A historical example with contemporary impact is the Water Tribunal of Valencia in Spain, designated as intangible cultural heritage by UNESCO. At a city and community level, the Catchment Neighbourhood connects to discourses in water-centric and water-sensitive cities (Novotny et al., 2010) that aim to integrate holistic water management, planning and community building. An action-research example is the initiative "Hydrocitizenship" (Hydrocitizenship, 2017), exploring how to form linkages between waterscapes, urban development and community building. In addition to this, suggesting the Catchment Neighbourhoods represents an effort to embed atmosphere as aesthetic and meteorological consideration into the functional practice of planning, relating to discourses in ecological thinking.

Figure 3.1.1
Map of Denmark marking the four case-study areas: Aarhus (Case Skejby and Aaby), Fredericia (Case Ullerup Brook), Odense (Case Boatmans Quarter). SDFE Plandata 2021.02.02 terrain. Not to scale.

3.2 Case of Aaby and Case of Skejby, Aarhus

Introduction

The following provides excerpts from two case studies, Case Aaby and Case Skejby, conducted in Aarhus during the author's doctoral research (Wiberg, 2018). The case studies showed a discrepancy between the planned and the expected functionality of the city and its "cloud-burst behaviour". A study of flow-path projections and their movement pattern in the urban landscapes of Aaby and Skejby illuminated that the same spatial characteristics, which afforded contemporary human convenience of automobility, also directed and increased the speed of surface water's movement between (and into) the buildings. In extreme rain, the administrative and economic boundaries were transgressed by water forming unintended interdependencies between up- and downstream actors, one flooding the other. In the case study of Skejby, this included the risk of critically flooding the region's largest hospital. Thus, local landscape practices had a critical impact on a regional scale. These findings led to the conceptualisation of Catchment Neighbourhood as a landscape-strategic research concept, to flood-risk, created by humans and planning, detached from terrain and water flows. The concept of Catchment Neighbourhood (from now on abbreviated as CANE) was further explored in the research project *Missing Link* (*Missing Link – Når vandene mødes i byen*, 2020).

Case Skejby – the building of flood risk with regional implications

Skejby Business Park is located at the fringe of Aarhus with functions such as businesses, institutions and the Central Denmark Region's largest hospital. In 2014, the preliminary flood-risk projections in the first municipal CA Plans revealed that the hospital was at critical flood risk.

On aerial photos of the Skejby area, the planning distinction between urban and rural zoning could be admissible. However, when superimposing the zoning geometry onto the contour lines and surface water of the historical map of the late 19th Century, the logic of the urban-rural zone becomes questionable at best (Figures 3.2.1 and 3.2.2). The superimposition exposes how the geographic planning delineations are detached from the larger-scale landscape characteristics (Wiberg, 2018, p. 396). When tracing the larger-scale sloping of the terrain, historical blue-green passages and the surface water systems, the logic of water's movement within the larger catchment, from the upper part of the business park and down to the recipient Egå Engsø, draws out. Geographically and planning-wise, the land-use delineations provided through planning classes, are arbitrary to, waterflow and the terrain's slope at a smaller scale. When scaling further down, it shows that the layout of cadastres, the geometry of footprints and buildings' orientation are also disconnected from the terrain and waterflow. The area's built spatial characteristics show a system of in-property terrain alterations and an urban fabric that acts autonomously in relation to the landscape and waterflow.

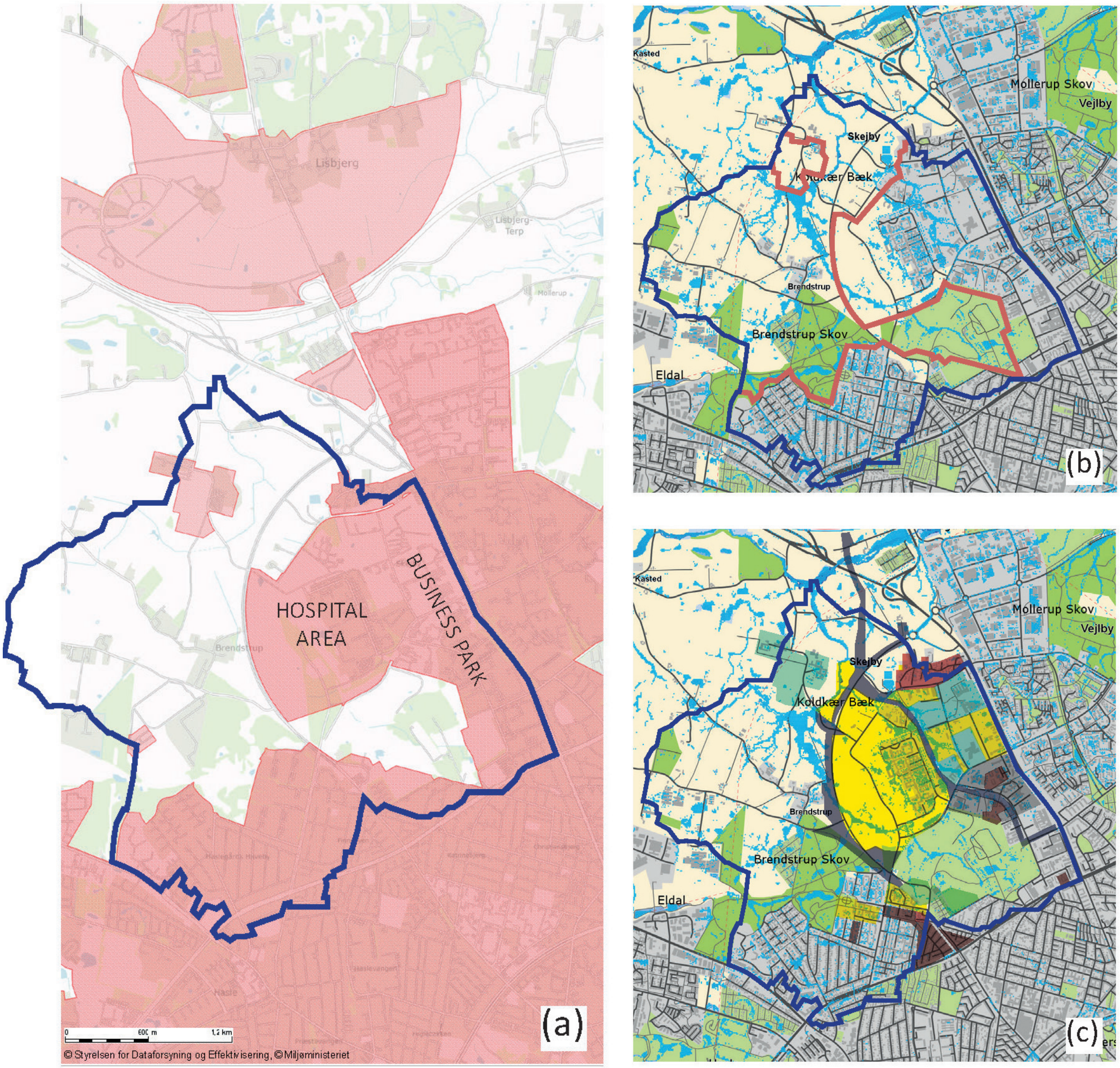


Figure 3.2.1
Skejby sub-catchment (blue line) with data on (a) urban zone (pink fill), (b) flow-paths and blue spots and urban zone within the catchment (pink line) (c) approved local plans in Skejby of 2016. Source: (a) SDFE, (b) Aarhus Kommune, (c) Aarhus Kommune, Plandata.dk.

Figure 3.2.2
Flood risk projection of the Region's largest hospital and relations to the larger landscape characteristic of the deep structure Brendstrup Corridor, starting south of the Business park, passing the hospital and Egå Engsø on its way to the sea. (a) tracing of contour lines and surface water from the late 19th Century map indicating the overall direction of the terrain and surface water. (b) flood risk projection on contemporary map (c) flood risk projection Skejby Hospital with a diagrammatic marking of flow-paths' direction on aerial photo, 2014. Source: (a) SDFE (b) SDFE, Aarhus Kommune, Klimatilpasningsplan 2014, (c) Aarhus Kommune.

In extreme rain events, waterflow transgresses the urban-rural zoning. In Skejby, the recreational and agricultural areas showed room for water and pervious surface cover, proving vital to the built Skejby Business Park area. However, an adjacent green area with pervious surface cover and potential room for water is disconnected from the built area.

The flood map explicates a physical interdependency between up- and downstream actors. The building layouts and local terrain modifications hold direct flood risk implications for downstream neighbours. In this sense, water establishes new interdependencies between rural and urban, institution and business, up- and downstream actors. The interdependencies created by waterscapes contrast with the planning designations, private property layout and the intended functionality. In a cloud-burst, the downstream cadastres become dependent on upstream cadastres, despite not being direct neighbours. Consideration of cross-scale relations between waterscapes, terrain and settlement patterns appear neglected.

Bearing in mind that the upstream properties unintendedly cause flood risk to the Central Denmark region's largest public hospital points to a criticality related to landscape and building practices. This very local disconnection between the built environment, landscape properties and natural processes directly affect the region's scale, crossing Jutland from East to the West. The flood risk projections of the Skejby area question the functionality of contemporary land-use planning and building practices with a literal connection to the meteorological atmosphere and, most likely, influencing the *aesthetic* atmosphere. Without in-depth knowledge on flood risk, the area appears with essential functions and a convenient spatial layout that accommodates automobility (parking lots, wide car lanes). At a personal level, the area's sensuous atmosphere is rather depressing. When adding the knowledge of flood risk caused by material practices, an atmosphere of uncertainty and neglect creeps in.

Case Aaby – Anthropocene sub-catchments causing flood risk

The Aaby area is located in Aarhus just inside the outer Ring Road, going from the edge of the catchment in the North and down to the river valley in the South. The area is mixed-use, with most residential areas such as villas, detached houses, social housing and public institutions, such as schools, kindergartens and nursing homes. The preliminary flood-risk projections of the 2014 CA Plan showed hotspots of water blocking the primary road that crosses the area from East to West. The problem was that flow-paths created flood risk on their way down to the river valley by taking detours caused by the road infrastructure's direction and slope. The primary road afforded the perfect fast-flowing of water in a cloud-burst, just like a riverbed of hard rock. Alternative routes and detours are not important to water, which will always find its way downstream. However, human interests are at stake. For example, safe and accessible roads for the emergency responders, mobility and damages to homes caused by flooding are locally at stake.

When studying the historical, late 19th Century map of the Aaby area, a landscape-based pattern is traceable, showing an array of blue-green passages from the upper watershed at the North and down to the river valley. These blue-green passages have been formed in the moraine hills by water since the last glacial period. The long history of water moving down the hillsides presents a natural, gravity-based system with soil conditions that can collect and lead surface water to the bottom of the river valley and then further out into the sea at Aarhus Bay. These passages are hardly visible today as they are blocked by perpendicular roads and buildings from upstream to downstream.

These blue-green passages are not as apparent on contemporary maps, and even less obvious when walking in the area, as streets and sidewalks follow other structural logic. When studying the historical map and the flood projections, part of the passages' surfaces is once again drawn by the larger flow-paths. By bringing this historical knowledge to on-site field observations, the former passages were rendered visible as subtle traces of water. A hidden knowledge was found that changed the experienced atmosphere. For example, systems of mosses on moistened foundations, slightly sunken asphalt on the roads and systems of water-craving willow trees became apparent, bringing an aesthetic atmosphere of water's presence. Studying the historical map's surface water, the contemporary map and projected flood-risk, together with on-site observations, showed a close connection between historical, present and future waterscapes that subtly render across time and space until expressed more critically in a cloud-burst.

Figure 3.2.3 d shows the Aaby area with its approved Local Plans. By superimposing the projected flow-paths and the approximate line of the sub-catchment, it becomes visible how each Local Plan is disconnected from the terrain and waterflow. This disconnection challenges local planning opportunities to adapt to more water locally. For example, each time a gradient is changed on an upstream parking lot, it can impose local changes in surface waterflow, affecting areas and local plans further downstream.

As in the Case Skejby example, the visual analysis of historical, contemporary and future maps connected with 1:1 experience from field trips showed how waterflow alters human-made boundaries in urban landscapes. For example, the distinction between public and private property, the individual and the collective, or the socio-economic separation between more expensive villas and social housing areas. In Aaby, the historical and projected flow-paths mark the unplanned, alternative interdependencies and relations within the "un-seen catchment". A mo-

Figure 3.2.3
Map (a) shows how the flow-paths follow the historical blue-passages as seen on (b) until it reaches the road, thus forming an urban sub-catchment detached from the landscape directions and causing flood risk to critical infrastructure. The Local Plans show arbitrary directions of terrain and water, thus complicating coherent climate adaptation to extreme rain events. (a) Aaby, flow-paths projection 2014, (b) historical late 19th Century map, (c) aerial photo 2015 with sub-catchment, (d) approved Local Plans, (e) diagramming of Local Plans attached to the sub-catchment.
Source: SDFE, MiljøGIS, Aarhus Kommune, Plandata.dk.

vement that goes from upstream to downstream while crossing a time span from the last glacial period to the present and further into the future. As in Skejby, the knowledge of flood risk projections and climate change further rendered a sense of new relationships beyond planning distinctions and private ownership – relationships formed by water and the catchment as a critical zone. With climate change, surface water is becoming an influential actor in urban landscapes, denoted by a changing meteorological atmosphere that literally will change the aesthetic atmosphere more locally.

3.3 Case Odense (Funen) and Case Fredericia (eastern Jutland)

Introduction

The case studies in Odense and Fredericia have explored the concepts of Water's Cityatlas and Catchment Neighbourhood. The following focuses on Catchment Neighbourhood. The methods were mappings based on GIS data analyses, historical maps, field studies and Design Comments with actors from the municipality and utility companies of the case-study cities. The concepts were studied via research through designing with an emphasis on visual methods. The two studies were conducted concurrently in order to inform each other.

Case Odense, The Boathouse Quarter – a visual exploration of the Catchment Neighbourhood

In Case Odense, two catchments were studied. Firstly, the larger Odense catchment, following the deep structures going from the South in the rural zone to the urban zone and city centre. This was done with an emphasis on Water's Cityatlas, seeing and reading water and terrains within the built urban areas, directly relating to Spirn's concept of Landscape Literacy at a larger scale (see Figure 2.1.3).

Secondly, a nested sub-catchment named the Boathouse Quarter[12] was studied to further explore water-based neighbourhood potentials via the CANE concept. The Boathouse Quarter is located east of Odense Harbour. The area is mixed-use, with mostly residential areas such as villas, detached houses, senior housing, social housing and institutions such as public schools and kindergartens. Part of the area is dedicated to testing climate adaptation strategies such as retention in rain beds (green streets in selected areas). We explored how the CANE could be made visible, sensible and understandable during this case. The objective was to make the sub-catchment interdependencies visible as an entry to planning and to point to a renewed perception of the neighbourhood connected by its waterscapes.

12 Skibhuskvarteret

Visual methods were used to explore the following: (a) geographical boundaries of planning and ownership vs the flows and processes of landscape and water, (b) how to transform knowledge from risk maps and prognosis into visual, more intuitive representation and how to affect the understanding of flood risk and up and downstream interdependencies and (c) to map local transformative capacities. Together, these mappings aimed to empower and support the capacity for reading the landscape with "signs of water" and to detect local potentials. To facilitate that a Catchment Neighbourhood would be both meaningful and context-sensitive, part of the analysis focused on local, transformative capacities (c) – site-specific potentials. For example, following the overall characteristics of the terrain and the projected flow-paths, studying historical maps for traits of former wet areas, identifying areas with room for water, of public relevance with outdoor areas and a need for renovating within the coming years. For example, social housing areas, public schools and kindergartens, parking areas on a former marshland, public parks and wide streets.

These mappings explored modes of seeing the urban landscapes from a water point of view, while also showing local neighbourhood potentials within the sub-catchment (examples of the visual analysis and mappings in Figures 2.1.3 and 3.3.1–3). Taken together, mapping these data was a way to show place-specific risk and place-specific potentials of the CANE. The visual analyses were conducted as field observations on spatial characteristics, sensed atmosphere and as mapping using GIS data. In addition, Design Comment sessions with stakeholders from the municipality and utility company were conducted. Figure 3.3.2 shows a photo series of diverse spatial characteristics, functions and atmospheres as a neighbourhood connected by and sharing the same catchment.

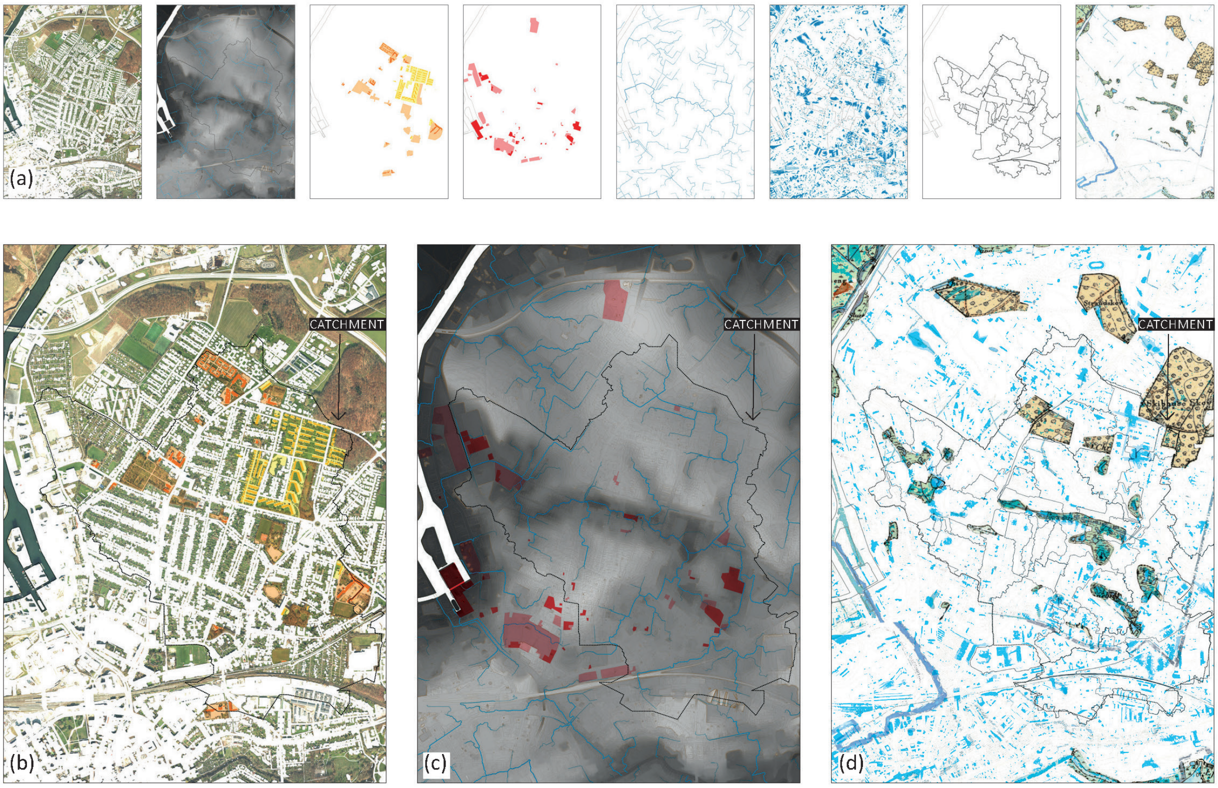


Figure 3.3.1
The map of the Boathouse Quarter Catchment (CANE) exemplifies visual explorations from water's point of view, connecting different types of data to see new systems in the existing urban landscape. (a) Eight examples of layers. (b) Impermeable areas (white) and location of public and semi-public functions, e.g., social housing, cemetery, nursing home, public schools (yellow, orange). (c) Emphasises the terrain, flow-paths and polluted areas (red). (d) Blue spots, catchment and sub-catchments, elements from historical wet areas.

Source: Kortforsyningen, Scalgo, via QGIS, 2020.

Figure 3.3.2
Walking the CANE from upstream to downstream with attention to spatial characteristics and pluralistic atmospheres. Excerpt from photo series with focus on traces of water and local transformative capacities, such as room for water, needs for renovation and the common good.

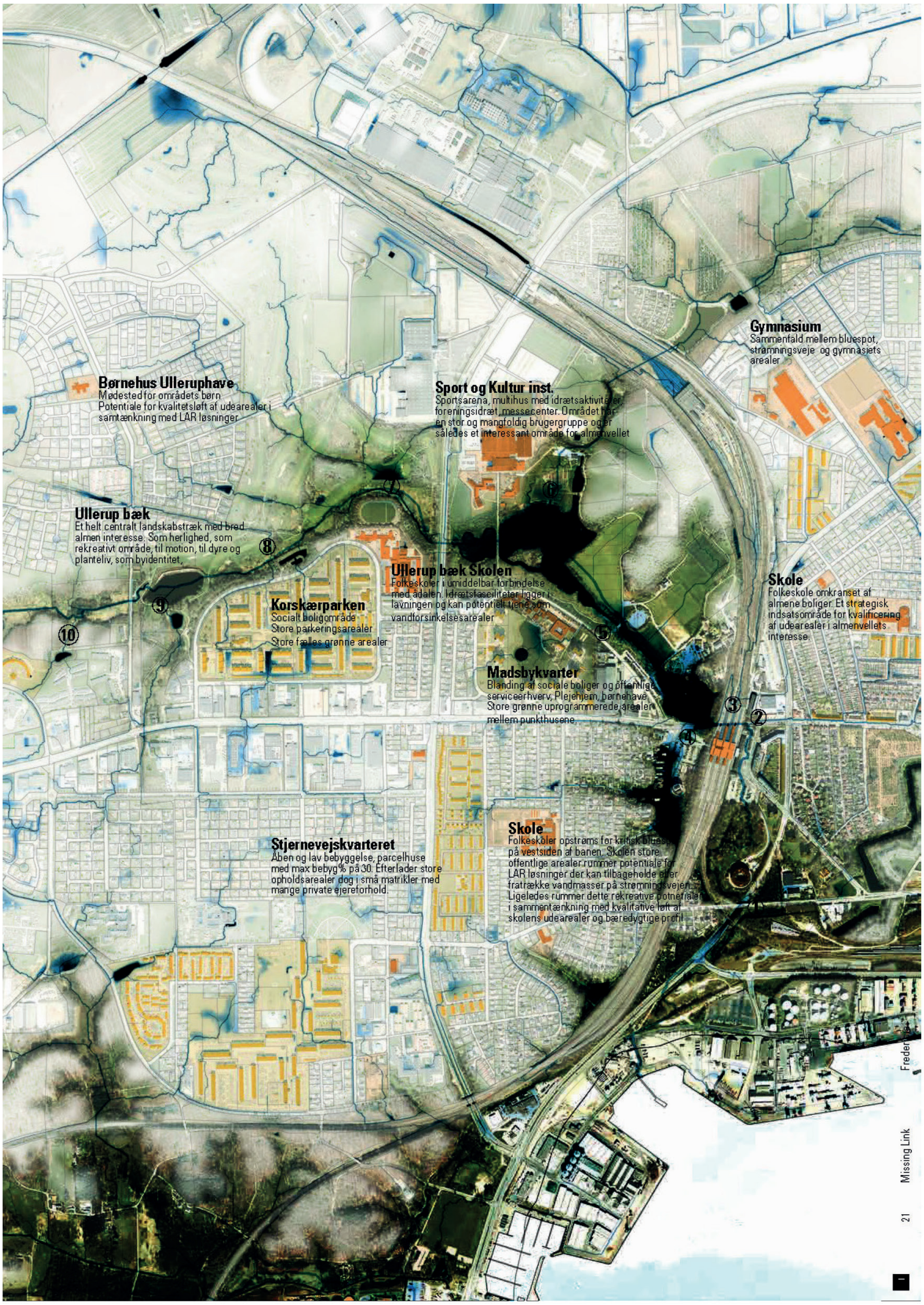


Figure 3.3.3
A sub-catchment of Ullerup Brook as potential CANE with place specific transformative capacities (landscape characteristics, flow-paths, blue spots, social housing and public schools). These exercises showed room for water and potentials for combining biodiversity, flood risk management and social inclusion.

Case Fredericia – exploring the catchment neighbourhood as a nested concept

In Fredericia, we decided to test the concept of CANE at both a more extensive and a smaller geographical scale, acknowledging catchments as nested concepts. This meant studying the larger catchment of Ullerup Brook with attention to its associated sub-catchments.

The Ullerup Brook catchment stretches 7-8 km., from the West to the recipient Lillebælt (sea) in the Southeast. The catchment starts in the rural zone with agricultural lands, enters the urban zone with residential, recreational and business areas, until reaching an industrial area at the harbour, close to the historical city of Fredericia. In extreme rain, water from the catchment floods primary infrastructure in the urban zone. Figure 3.3.1 shows examples from exploring how to visually render the urban landscapes from a water point of view, using field observations and visual analysis. The sub-catchments of Ullerup Brook represented potential CANES, which could be connected to a larger catchment strategy. For example, by increasing connectivity and room for water in the larger catchment over time, with focus on not only water, but also biodiversity, mitigation and recreational routes. The sub-catchment CANES showed local transformative capacities, for example, via social housing with need of restoration and large outdoor areas in former blue-green passages, as well as business areas with immense parking areas with potential for transformation. The CANE was also tested on the catchment of the historical inner city.

3.4 Reflection on case studies

Climate adaptation and the building of flood risk

Increasing precipitation and extreme rain events are critical in the Danish Climate Adaptation Plans (CA plans). However, cloud-bursts are not the only cause of flood risks, as planning and landscape practices also form flood risk. The Aarhus case studies (Wiberg, 2018, p. 400) showed how generic settlement patterns detached from the terrain and how waterflow also increased flood risk. Furthermore, the material practices of terrain alteration shaped by the in-property logic of maximising utilitarian value, e.g., parking and the significant amounts of impervious surfaces, were increasing flood risk and associated damages to human interests. The case studies indicated that, to a noticeable degree, what turned water into a threat was human-inflicted. In Case Skejby, this threat was created through urban landscape practices of designing sealed buildings located and designed in autonomous manners, prioritising low-friction car movement and generous parking options and a foundational neglect of deep structures. Practices that were supported by planning focused on functions and geographical delineations detached from the terrains. This connects in many ways to the methods and discussions provided by Ian McHarg on the criticality of neglecting landscape properties and processes. The detachment between the landscape properties, planning and building refers to Anne Spirn's coining of the term Landscape Illiteracy.

Despite voices since the early 19th Century pointing to a need to consider human landscape practices, despite VVMs and despite the recent establishment of municipal Climate Adaptation Plans in Denmark, there still seems to be some way before a more processual, ecological approach becomes integrated into contemporary Danish planning and urban development. The planning zones, local plans, urban development plans, the geometry of property lines and buildings still seem focused on utilitarian values and land use, expecting humankind to be in control. In contrast, connectivity, processes and atmosphere are not integrative parts of planning. One could speculate if, in themselves, such landscape (il)literate practices support an anthropocentric modus of "seeing" and sensing the urban landscapes. At the same time, in all the case studies, the collaborating actors from municipalities and utility companies revealed an interest in changing practices.

The concept of CANE was explored to address a processual approach, attached to key geographical factors in Danish planning. It is a proposal for formally inviting in the sub-catchment, including it for community building and public spaces for the common good and combining climate adaptation and waterscapes with holistic, coherent, cross-scale urban development and plural values. The meteorological atmosphere of climate change and changing waterscapes connects directly to meteorological atmospheres and influences the sensuous, aesthetic atmosphere at a neighbourhood level, in any case, either through adaptation measures, the experience of flooding or at the level of knowledge about flood risk and climate change. It follows from this that our landscape practices in planning and building suffer consequences from being detached from the atmospheric qualities of water and the critical zones of catchments.

Reflection and conclusion

4.1 Landscape and planning practices in the Anthropocene

Landscape (il)literacy and landscape literacy

In their very essence, planning practices are landscape practices. The visual analyses of Case Skejby and Aaby showed how the settlement patterns and material practices were disconnected from waterflow and landscape properties, and also how this contributed to increasing flood risk with local and regional implications. This essay argues that the detachment between terrain, water and the built environment reflects ignorance of the reading of the landscape and its processes as an integrated part of planning practices. These practices and their consequences are not new, nor only Danish. As described in the introduction, Anne Whiston Spirn performed case studies in Philadelphia in the 1980s that showed a discrepancy between urban development and the reading and "seeing" of the landscape, thus creating not only flood risk to the residents but also a sense of resignation (Spirn, 1991; 2005). Spirn's term Landscape Illiteracy is well conceived; landscape literacy can be learned, just like reading (Spirn, 1998; 2005).

Learning from history and the change of practices

This essay's point of departure was the need for climate adaptation to changing waterscapes, taking the stance that the level of uncertainty related to climate change is a call for redefining contemporary practices in the urban landscapes of the Anthropocene. The pivot has been water as a vital, physical matter that is atmospheric in many senses. The objective was to discuss how contemporary planning and urban development practices are deficient in meeting future needs. The learning from history and ecological urbanism has shown that excluding water and landscape-based readings has contributed to creating flood risk. The case studies have served as examples in the context of Danish municipal planning.

Changing waterscapes and changing neighbourhoods

As a propositional approach, this was explored by suggesting the Catchment Neighbourhood (CANE) as a concept and a method that could tap into planning methods; a geographical division of land while also providing cross-scale considerations and processual understandings. Land-use planning provides distinctions in terms of functionality and regulatory purposes. In contrast, concepts of the neighbourhood often build on shared characteristics like building typology, function, cultural or socio-economic reasoning. From the perspective of landscape architecture and planning, climate change and waterscapes of the Anthropocene might be a call to reconsider the premises of area-designations in planning and notions of neighbourhood. The Catchment Neighbourhood can be seen as a quite literal and practical concept for opening an array of potentials in the cross-field of planning, design and ecology. The CANE is an effort to address adaptation via water and correlations between the meteorological atmosphere and aesthetic atmosphere in the era of anthropogenic climate change. By acknowledging catchments as critical zones in planning, water can become the non-human actor in urban development, providing a physical and tangible motivation and an understanding for changing practices and minimising flood risk. Furthermore, water could introduce a shift towards integrating processual and cross-scale thinking in planning as a founding parameter for urban development. It is time for changing current landscape practices in planning and urban development. Moreover, bringing in water as a fundamental actor could link the different municipal planning levels while also providing a more graded, processual view on spatial qualities and flows of human and non-human actors with emphasis on atmosphere – both in a meteorological and an aesthetic sense.

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