From Tower Block to Neighborhood

Developing for winter in Nuuk

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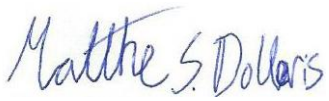

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1. Introduction

Life in the arctic is not like other places. Few places in the world are so characteristically influenced by the natural environment as the cold cities and settlements around and north of the arctic circle. Creating safe and healthy cities with cultural dynamism, affordable housing, social equity, good public transportation, clean air, community involvement, stimulating public spaces etc. are priorities with most city planners and designers around the world, but in the cold regions of countries such as Canada, China, Japan, Finland, Norway, Sweden, Iceland and on the island of Greenland, planners and designers have to create good, livable and lively cities in conditions that do not afford comfortable, outdoor activity in the winter (Pressman, 1996*)*. Coping with harsh environmental conditions and a hostile climate is often perceived as a fundamental aspect of what it means to live in this part of the world, as the general way of life and everyday living is shaped by it. As such, cities located in the coldest regions of the world must be developed and adapted to accommodate the interdependent aspects of the arctic climate and the arctic cultures.

Although local climate conditions influence urban living in most places on Earth, the climatological conditions of the arctic afford opportunities and pose challenges, exclusive to this part of the world (Pressman, 1995). Academics working with the build environment in the arctic identified the most impactful of the climatological features as follows:

- *Temperatures - often below freezing*
- *Precipitation – often in the form of snow*
- *Light – low annual amount of sun hours*
- *Seasonality – prolonged periods of the above stated.*

(Pressman, 2004, p. 5)

Long seasons of low temperatures, few daily sun hours and heavy snowfall affect many aspects of a society. Due to the physiological uncomfortability of cold temperatures and darkness, the harsher seasons change many aspects of life in winter cities. As climatic conditions in the northern regions of the world are considerably more hostile to human physiology compared to those of the temperate regions, culture, identity, ritualistic ways and social behavior in the north often relate to some form of thermal comfortability (Pressman, 1995). It could therefore be inferred that the built environment would be adapted to support the living conditions. However, as globalization, increasing standardization in building construction, internationalization of architecture and planning, stylistic trends, economic dictates, and political prioritization have been, and still are, amongst the most influential forces in shaping cities, regional particularities have less impact in the building industry. Climatological sensitivity is a such regional concern and is often underappreciated, causing winter cities to suffer from housing developments that exacerbate existing wind conditions and reduce the amount of available sun in the daytime, high maintenance costs for infrastructure and public spaces suffering from lack of context and relevance, poor functional performance and exacerbated climatological challenges (Pressman, 2004) (Pressman, 1996) *(*Shao & Wenbo, 2012*)*.

Architectural academia recognized the challenges of living and developing in the arctic as early as the 1950s, with Ralph Erskine making housing and settlement plans based on the cold conditions in Canada and Sweden. By mid-1980s, arctic urbanism gained momentum in Canada, Sweden and Norway with the Winter Cities Association, which became the main source of literature on the subject and emphasized the

importance of urban design for livability in cold climate cities. The foundation of the work was to map a northern "identity" and to create a local, architectural vernacular for cities with long winter seasons, the so-called "winter cities". Where architecture in the arctic before the association had been focused on creating outdoor public life for the warmer month, and indoor public life for the colder months, the Winter Cities Association emphasized the need to consider the challenges and opportunities of each season (Stout et. al, 2018) (Pressman, 1995) (Pressman, 2004). As a fundamental aspect of urban design is understanding the processes that shape cities, winter city academics and designers argued for an increased focus on climatological sensitivity in urban design, and showcased practical solutions for creating comfortable, locally bound urban space designs (Pressman, 1995) (Pressman, 2004) (Zrudlo, L.R. 1988*) (Mills, 2006) (Ebrahimabadi, 2012) (*Meng & Setoguchi, 2010*).*

The Winter City Movement's work with arctic urban design discusses and underlines two neglected layers of urban design in winter cities: The relationship between northern cultures and the climate, and urban design solutions corresponding to a climate sensitive approach to urban development. As the urban design solutions are based on an understanding of building cultures found in Canada, United States of America, Sweden and Norway, it does raise the question of whether the knowledge of arctic urban design and the solutions found in the literature are applicable in winter cities of different cultural backgrounds. If a winter city differs from North American and European urbanism, the arctic urban design solutions might not be applicable (Ahmad et. al, 2011) (*Chapman et. al., 2018*). A possible consequence hereof is design solutions equally out of place and context as the standardized urban environments. The question then becomes: Are the cultural considerations and subsequent design solutions in arctic urban design rooted in North American and Northern European culture to a degree that renders it unsuitable for use in other cultures? On the island of Greenland, in the capital of Nuuk, the urban environment underwent dramatic changes in the 1950's, with the construction of large housing complexes, schools and institutions, changing the small scale of the city (Grydehøj, 2014). Since then, the city has developed rapidly due to an increasing migration from the smaller communities in Greenland to the larger cities, and large urban districts have been developed since. The planning authorities have, however, not had a dedicated policy for architecture, urban design and landscape architecture until 2015, where the first unique publication on the subject was published, based in the existing planning culture, and in an effort to communicate priorities in the built environment (Kommuneqarfik Sermersooq, 2014). According to the planning authorities, the current architectural trends in Nuuk has very little to do with Greenlandic culture, and the local architects argue that the architectural policy has limited use since the planning authorities are focusing more on masterplans for district developments. The subject of this paper will be to investigate if arctic urban design considerations can be translated into the settings of a Greenlandic culture, and if so, how it can assist in restructuring the architectural policy for the city of Nuuk, for future developments and retrofitting of existing urban areas. This focus leads to the following investigative questions and research question:

How can arctic urban design be the foundation for a revision of the Architectural Policy in Nuuk?

- *What architectural- and urban design concepts are prevalent in arctic urban design?*
- *What challenges are hindering meaningful and functionally sound urban design in Nuuk?*
- *What aspects of arctic urban design are relevant in the context of Nuuk, Greenland?*
- *How can relevant design considerations be synthesized with local planning culture in Nuuk*

2. Research Design

To get an understanding of arctic urban design as a field of research, and the possibilities of applying its concepts, strategies and practical tools, a mixed method approach was used, including a literature review of arctic urban design and, a case study of the planning system in Nuuk, and semi-structured interview to gain insight into the planning prioritizations of urban professionals in Nuuk.

Researching the theoretical field of arctic urban design was undertaken in an effort to gain a thorough knowledge of the contemporary research in the field, and identify gaps in the research for exploration. Using academic search engines to conduct the literature review, Google Scholar and Scopus generated more than 320 publications on the subject.

Arctic Urban Design

Search engine: Google Scholar

Keywords: Arctic Urban Design (20 hits)

Search engine: Scopus

Keywords: Arctic Urban Design (46 hits)

Keywords: Winter Cities (282 hits)

Keywords: The Winter City + Public Space (83 hits)

Taking its departure in the Winter City Association, the work done by Norman Pressman in the field of winter cities is the theoretical gave an in-depth understanding of the planning problems faced in many cities situated in cold climates, and let to recent years research into performance design for buildings, in terms of climatological conditions as wind tunnel effect, shadow patterns and snow accumulation.

The case study of Nuuk was chosen as the architectural considerations for the city are relatively new, with considerations for urban design and architecture being a relatively new concern, compared to other winter cities. Investigating the planning system in Nuuk revealed an inconsistency between the natural environment and the urban planning culture. Despite the obvious challenges in the city with poor microclimates due to strong winds and cold temperatures, the prioritization of the government, planning authorities, and developers seemed to be with housing developments, with no prioritization of public, urban spaces.

In relation to the empirical work on Nuuk, 4 semi-structured, qualitative interviews were made (Travers, 2013). The semi-structured methods was preferable as the intention of the interviews were to gain insight into the planning culture in Nuuk, the prioritizations of the municipality, and the knowledge of arctic urban design amongst local architects. As such, the interviews were based around pre-determined interview questions, to get an understanding of areas of interest, but as the interviewees were not familiar with the questions, the there was opportunities for follow-up questions and relevant divergence in the conversation.

3. Nuuk

Greenland, the largest island in the world, has the smallest capital, with its approximately 17.000 inhabitants. The city is located just south of the arctic circle, with the climate and seasonality of winter cities. Like cities all over the world, Nuuk is experiencing an increasing migration, with another 3.000 Nuummiuts in need of housing in 2030, accounting for 40% of the country's total population (Kommuneqarfik Sermersooq, 2019). Nuuk in general is undergoing large as a case for arctic urban design intervention is interesting as the urban fabric of the city is different to the planning cultures found in most of the cities investigated by the Winter City Association and other winter city academics. Land development in Nuuk is expensive due to the city being situated on a mixture of rock and permafrost, and infrastructure in the city has historically been focused around necessities such as roads, water, heating and electricity, both due to the time-consuming and expensive process of building on solid rock, but also due to Greenlandic culture and laws prohibiting private land ownership (Kommuneqarfik Sermersooq 2007). During the Danish colonial occupation of Greenlandic, the Danish government introduced new housing typologies in the 1950's and 1960's, developing a mix of large 4-6 storey apartment buildings, terraced housing and single-family homes throughout the central part of the city and along the coastline (Kommuneqarfik Sermersooq), 2019 . Due to the harsh arctic climate, much of the housing from that time is in poor shape, with some of it being renovated, and the rest torn down for redevelopment. Concurrently, Nuuk is expanding west, around Nuuk Fjord, where several new housing districts are being developed, with plans for development all the way down the coast (Kommuneqarfik Sermersooq 2011)

With Nuuk's rapid expansion, concerns have arisen amongst locals and professionals about the quality and scale of recent years' development trends, as Nuuk has historically been built with low density, and at or below 6 storeys. Recent years' development projects have been different in scale, but as land development is expensive, many 8-story apartment buildings are being built and 10-12 storey tower blocks have been introduced in the city. Due to the large open spaces between buildings, the city feels very open, are everywhere due to the low density, but well-designed urban spaces are few, and most unbuilt spaces are either used for parking or kept untouched. While the openness has the benefit of many urban spaces having direct sun light for most of the available hours, Nuuk is suffering from strong winds traveling through the city, and being exacerbated down the main streets and the main shopping street at Imaneq (McBride & Douhovnikoff, 2012*).* Debates in Nuuk over urban development are commonplace, and the increasing rate of high-rise construction is creating debates on what constitutes good urban development in a setting such as Nuuk, with the local population emphasizing the need for better coherence between the projects being built in the city, and the surrounding public areas, emphasizing lacking shelter in the winter and underperforming recreative areas (Kommuneqarfik Sermsersooq & Grønlands Selvstyre 2011) (Kommuneqarfik Sermersooq 2015).

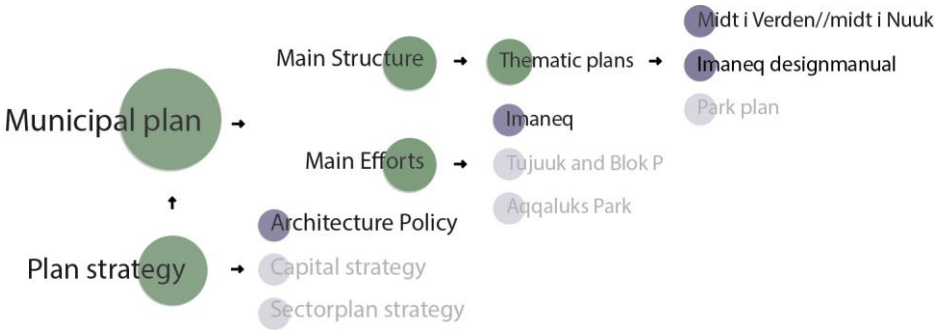
In an effort to create a common architectural vernacular for urban design and architecture in Nuuk, to ensure coherent development across the city, the city council decided in 2010 to create an Architectural Policy, rooted in the priorities of the local population and the city council itself. As plot development in Nuuk is anchored around revision plans, the Architectural Policy holds no statutory provisions, but communicates the values that the planning authority will seek to uphold in development projects. Statutory requirements for developing is found in the municipal plan, and revision plans are space-specific development plans and must be in accordance with the overall visions of the municipal plan. Therefore,

the Architectural Policy acts as a guidance tool for the municipality, designers and developers, and the following chapter will be an investigation into the provisions of the policy.

Modern architecture and planning culture has shifted the development culture of Nuuk away from being anchored in landscape and climate, and into a standardized building approach that does not relate to the local culture and Nuuk is an interesting city in terms of microclimate and culture, as the city's low density and wild landscape of rock and sudden changes in topography creates a unique urban landscape.

Architectural Policy

To understand the relevance of applied arctic urban design in Nuuk, it is necessary to understand the planning culture, and priorities in the built environment. The planning system in Greenland is structured on the basis of the Danish, with planning divided into national interests, municipal planning and city planning. However, where Danish municipal planning utilize local plans with binding regulation for the individual parcel, urban planning in Nuuk is done on the basis of municipal revisions for the individual project. The municipal plan covers all political prioritizations in the city, is in effect for 12 years and is revised on a 4-year basis through a plan strategy created by the appointed city council. In the revision of the municipal plan, the city council can also appoint new *main efforts*, subjects that require special political attention (Kommuneqarfik Sermersooq, 2019). In 2010, the city council decided on three new areas of focus, one of which was an Architectural Policy.



1 Municipal plan hierarchy for Architectural Policy and master planning

Where architecture and urban design until 2015 was addressed mainly in the context of housing and political prioritizations, the Architectural Policy is an attempt to synthesize the needs of the local population with the development of a common architectural vernacular for Nuuk. In this chapter, focus will be on the urban structure of Nuuk and the Architectural Policy, its prioritizations, potentials, challenges, and applicability in ensuring better architecture and urban design in present and future developments in Nuuk. Unless otherwise stated, the source of the following chapter is the Architectural Policy, *Arkitekturpolitik* (2015).

The basis for the Architectural Policy is the wishes, needs and prioritizations of the local Nuumiuts, whom were introduced to the idea of creating a city-wide Architectural Policy through citizen participation workshops focusing on their understanding of identity, good housing, quality of life, urban spacing and livability, and time and space considerations. Created upon the discussions and wishes identified at these workshops, the Architectural Policy addresses urban development in Nuuk based on the four subjects:

1. Identity-creating architecture
2. Housing and quality of life
3. Urban spacing and city life
4. Time and place

The four subjects are not considered individual efforts but are part of a holistic approach to ensure stimulating, locally bound, high-quality urban development in Nuuk (Kommuneqarfik Sermersooq 2015). The policy states that one of the main concerns amongst the participants at workshop was an increased attention to creating attractive surroundings in the city that invite stay and social activities, will be discussed more in-depth here.

Regarding urban spaces and city life, some of the subjects emphasized by the participants were: proximity, responsibility, soft mobility, social and cultural pocket spaces, decentralized shops, calm and quiet surroundings, lighting, better designed urban spaces, city life both day and night, and variation rather than repetition. Likewise, regarding "time and place", the locals emphasized the need for stronger relation to context when building, accessibility, holistic planning, quality of life and climatological considerations.

With concerns to housing developments, the policy argues for density, as the values of the neighborhood comes from proximity, creates opportunities for life between the buildings, in sheltered, lit spaces where socialization is safe and encouraged. Outside the pocket spaces, the surrounding urban landscape must be exciting and safe, to increase the sense of belonging and feeling anchored. For urban spaces, the "good urban space" will build up communities and increase social cohesion. Priorities for urban spaces are: Scale, respecting the human scale and activities afforded in the specific place; accessibility for young and old and physically disabled; lighting, to ensure safety and to frame the space in winter; Microclimate, to ensure shelter from wind and noise pollution, give access to solar radiation and incentivize stay. Urban spaces are often part of a network, and so spaces should be connected by paths. Some spaces afford active play, others afford quiet stay, and as human needs are different, a good city affords different activities and qualities.

Actionable approach

As mentioned earlier, the policy holds no statutory provisions, but contains a chapter on an actionable approach to the policy, emphasizing how different actors can utilize the policy, including a notion of further developing the Architectural Policy for statutory provisions and recommendations. Whether considered by designers, developers, clients, or citizens. The actionable approach describes how the planning authorities will act in new developing projects, dependent on its role in the process. As such, the actionable approach are a self-imposed expectations for the planning authorities.

As a client, the municipality will utilize the policy as a check list for development projects, ensuring that developments are in line with the objectives of the policy. As the municipality owns a large number of buildings in the city, they are ultimately responsible for the maintenance and function of the buildings and the surrounding areas.

As planning authority, the municipality will seek to adapt as many of the goals in the plan as possible into the municipal plan, to turn the recommendations into requirements. As such, if a development project contains important provisions, the municipality can demand documentation for the realization of the provision.

As an inspirator, the municipality will ensure that schools teach Greenlandic building culture, both historically and present, and act as councilor to the construction industry, making entrepreneurs aware of the policy and provide guidance should it be requested, and potentially award architectural prizes for good design.

Tools

The first edition of the Architectural Policy contains no appendix with actionable tools for urban development, but argues for

- Use of conservation plans for buildings that are deemed culturally important for Nuuk
- Create Green Papers for housing, urban design etc. with examples of good design
- Lastly, the use of architectural prizes can be utilized to incentivize good architecture or design amongst developers and architectural firms.

As described in the policy, the document as of today is lacking actionable requirements and tools in order to be able to influence the current and future development of Nuuk. As part of the fieldwork in Nuuk,

Urban Developing in Nuuk

The idea for an Architectural Policy to be the foundation for urban development in Nuuk can be found in the municipal planning back in 2010. In 2015 the policy was published, but has had little impact on decision-making, both in the architectural firms and within the municipal planning department (Sværd, 2019; Barfoed, 2019). To get an understanding of why the Architectural Policy has had limited impact in the continuous development of Nuuk, a literature review of urban development plans across local and national planning was conducted, as well as interviews the planning department's city- and housing branch, By- og Boligafdelingen, the largest, and publicly owned, developing company in Nuuk, Nuuk City Development, and two architectural firms in Nuuk, Tegnestuen Nuuk and TNT. In the following section, the relevant findings from the literature review and the interviews will be discussed, to get an understanding of what cultures are prevalent within the field of urban development in Nuuk, and what potentials there are for making the Architectural Policy more applicable.

National planning

Due to the construction boom in the 1950's and 1960's, a large percentage of the built environment in Nuuk is under the authority of the Greenlandic government, Naalakkersuisut. In the interview with the City- and Housing department of Nuuk, the two planners, Runa Sværd and Bilo Høegh Stigsen, argued that many of the renovation- or rejuvenation projects in Nuuk are done by the national government, as the buildings are owned by them. The national budget for renovation and rejuvenation is divided on the different municipalities in Greenland, and as Nuuk has a large backlog for renovation and rejuvenation, the budget afforded to Nuuk has to cover a relatively large amount of housing projects (Departementet for Finanser og Skatter, 2017). As the pressure for housing in the capital is high, the combination of expensive land development costs and a limited budget increases the incentive to build vertically, and to limit land development that is not required for housing construction. Nuuk is currently constructing an international airport and expanding the industrial harbor, meaning that development funds are stretched in Nuuk. The

basis for architecture and urban design on nationally owned structures is the Architectural Policy, that, as was just discussed, holds no legal provisions. Furthermore, the overarching attention to housing and development in the national planning for Nuuk is centered around creating favorable investment climates, to promote good public and private investments in the city (Departementet for Finanser og Skatter, 2017). As the Architectural Policy holds no recommendations regarding public- or private investments, a possible hindrance to the applicability of the policy's recommendations is a lack of economic incentive for both public and private developments.

Municipal planning / Nuuk City Development

Larger municipal projects in Nuuk have been gathered under the public, limited company NCD, "Nuuk City Development". Projects made by the company are owned by the municipality, but the project expenses have to be covered by the NCD, and thereby through private funding and partnerships, which in recent years has come from both American, Canadian and Danish investors. The NCD is effectively responsible for all land development in Nuuk, meaning that the expenses for both land development, infrastructure and building construction has to be funded by private investments (Frederiksen, 2019). Where publicly funded land development and infrastructure sets a strong precedence for setting strict demands for urban design and architecture for developers, having the funding for the entire project come from private investors makes it more difficult for the municipal authorities to make recommendations based on the Architectural Policy, also considering that the NCD is a municipally and state owned company. The NCD currently has large development projects in both Nuuk center, with a large shopping mall being expanded with 10 storey office building, and the urbanization of the fjord east of Nuuk, at Siorarsiorfik. For these large projects, separate master plans are developed, addressing housing, urban space design, transportation etc. As argued by Runa Sværd (2019), working in the City- and Housing department, the planning department have had to develop design manuals for NCD's projects, in accordance with the Architectural Policy, to ensure that the planning department's visions for the architectural and urban design development of Nuuk were incorporated into the development projects at NCD. Jens Frederiksen, director of NCD argues that the NCD is a urban development company, not a construction company, and as such they take the design manuals and visions of the municipality very seriously, but that they let the architectural firms working on the projects create the architecture and design solutions (Frederiksen, 2019).

Municipal Planning / City- and Housing Department

The municipal planning for urban space and architectural design in Nuuk cover a variety of different plans, including the Architectural Policy, a main structure for Nuuk, an arctic capital strategy, a capital strategy, a plan strategy, a regional development plan, several structure plans for areas around the city, design manuals and a recreative strategy. All of these plans are for use by the municipality and are used to communicate priorities for the development of the city, across departments and interests. When asked about the plans, David Christopher Pedersen of the architectural firm TNT argues that it can be difficult to remember one plan from the other. Nevertheless, the different plans hold potentials for a coherent, architectural and urban design development of Nuuk, and as such the most important provisions of the different plans are investigated.

According to the main structure for urban development in Nuuk, the municipal plans' main document for the overall development visions for Nuuk, the Architectural Policy was created as a "benchmarking" tool for all developments in Nuuk, to ensure that the development projects are in line with the municipality's

original intentions. Following the Architectural Policy, separate design manuals will be developed for large development projects, design manuals that will adapt the overall values of the Architectural Policy into the specific context. As such, the Architectural Policy is intended to be a check list for large developments undertaken by the NCD.

Throughout the municipal papers it is argued that green structures are essential to the city's urban life, but in the plans there is no distinction between the open, untouched topography and designed urban space (Kommuneqarfik Sermersooq, n.d) (Kommuneqarfik Sermersooq 2007)(Kommuneqarfik Sermersooq & Grønlands Selvstyre 2011). This is problematic, as argued by architect David Pedersen of TNT (2019), as most spaces between housing developments as such are kept untouched by developers, with miniscule investments in wooden boardwalks to meet pathing requirements, but as argued by architect Davis Pedersen from TNT (2019), the untouched topography is a dominant feature in the urban landscape in the sense that many urban spaces are just left without any design interventions. Contrasting, Runa Sværd of the planning department argues that the rock formations in Nuuk are beloved by the locals and important open areas between the structures (Sværd, 2019). In the main structure for Nuuk, it is argued that architecture and urban design is also relevant in the sense of creating a capital for sub-cultures and creatives, as well as boosting the identity as an arctic capital. This notion is interesting as it considers the wider connection between urban space, architecture and societal development. It is argued that the attractiveness of Nuuk must be further developed, through interventions focusing on charm, beauty, art, views, culture etc. (Kommuneqarfik Sermersooq n.d). At the same time, it is argued that the future for urban development in Nuuk is taller, denser, and larger, with no explanation of how that vision can support better urban spaces and cultural values in Nuuk.

In the large pool of plans for the development of Nuuk, two plans focus on the many potentials of the public space environment in Nuuk, and discuss their place in the future development of Nuuk. n the city-wide plan for recreative areas from 2007, the recreative structures of Nuuk are divided into four categories (Kommuneqarfik Sermersooq 2007)

1. Spaces that are due to their landscape qualities must be kept as open landscape.
2. Spaces that due to their recreative potentials must be kept for recreative purposes, though being allowed further recreative affordances
3. Spaces whose recreative value is determined insufficient and can be used for other urban purposes
4. Spaces that due to terrain or lacking accessibility can be taken out of the recreative structure.

(Kommuneqarfik Sermersooq 2007)

Investigating and labeling the potentials of all urban spaces in the city enables the planning authorities set higher demands for urban space design in development projects, as there is a clear understanding amongst all actors involved, of what spaces hold potentials and how that potential should be utilized (Kommuneqarfik Sermersooq 2007)

As part of the discussion on recreative values found in the urban spaces across Nuuk, the plan lists the different sports activities and socialization possibilities found in and around Nuuk, which is relevant as recreation in the other municipal plans are kept fairly vague. It is emphasized that despite the open structure of Nuuk and the many public spaces, the city is lacking coherence between recreative areas, and especially for stay areas designed for sitting, chatting and observing. Generally speaking, there is a consensus among Nuumiuts that Nuuk is more bland that is should be, and that urban spaces are in need of greening, with flowers and trees, as well as more art and decoration (Kommuneqarfik Sermersooq 2007)

For the four levels of recreative areas, the urban ones deemed optimal for recreative use are divided into yet another three groups:

1. Spaces that are due to their landscape qualities must be kept as open landscape.
   These spaces hold landscape values that are essential in providing Nuumiuts the possibility to decouple from the urban setting of the city. Areas kept free from design should be connected by paths that underline the natural setting and the connectivity of the scenic spaces and provide viewing plateaus along the paths.

2. Spaces that due to their recreative potentials must be kept for recreative purposes, though being allowed further recreative affordances
   Spaces that hold recreative potentials for active recreation should be designed and utilized for large, recreative installations. The recreative areas should be connected by pathways that encourage active use.

3. Spaces that due to their potentials for casual socialization should be designed for social gatherings
   Spaces whose recreative potentials revolve around stay should be designed for casual socialization.
   The casual urban spaces should be connected by pathways emphasizing socialization

Creating well-connected urban spaces in Nuuk will require well-lit paths due to the dark winters, and pathing in central Nuuk should be centered around interesting sites in the city, and contain pocket spaces along the routes The plan concludes that an action plan for recreative areas in Nuuk should invest in greening, lighting, urban furniture for shelter, art and playgrounds, while involving the local inhabitants in the process of creating public spaces (Kommuneqarfik Sermersooq 2007)

From discussions with the local architects, there are very opposing opinions on the scale Nuuk should be focusing on, as Pedersen is positive to the idea of building taller structures in Nuuk, for the sake of meeting housing needs, while Barfoed (2019) is against it, arguing that it ruins the possibilities of creating good urban spaces by generating too much shade and creates wind tunnels. Furthermore, Barfoed (2019) argues that too many development projects lack consideration for orientation, with potential for sheltered pocket parks being lost.

The last municipal document that will be discussed is the plan for development in one of the old apartment blocks, known as Blok P. The plan emphasizes the need for spaces to not be considered set in stone, but evolve in accordance to the needs and wishes of the local population, through citizen participation and temporary urban design (Kommuneqarfik Sermersooq & Grønlands Selvstyre 2011). Like David Pedersen from TNT, the plan argues for the "empty void" between houses, that a passivity towards the public spaces of the city has become the norm, and that the large gaps between structures in Nuuk are not open landscapes, but emptiness caused by a planning culture that has emphasized efficiency in construction, infrastructure, parking and snow clearing (Kommuneqarfik Sermersooq & Grønlands Selvstyre 2011). The interesting aspect of this master plan is that it engages in discussions on urban design on an equal level to housing. It is argued that the challenges in creating good urban spaces is Nuuk comes from low density, and that pocket parks are easier to create in denser neighborhoods due to the natural shelter from buildings (Kommuneqarfik Sermersooq & Grønlands Selvstyre 2011). The project holds detailed considerations on urban design solutions such as flora and urban furniture, and this contrasting attention to detail and consideration for urban space design when compared to smaller projects is interesting.

Planning for urban spaces in Nuuk is affected by several levels of government, with multiple political agendas and visions. What the city is lacking is a consistent consideration for the importance of urban spaces, and a clear framework for how to approach urban space design, whether the development project is part of a master plan, or a small housing project. To create a stronger foundation for urban design in

Nuuk, the theoretical- and practical research into arctic urban design is introduced, with the goal to identify conceptual solutions for a revision of Nuuk's Architecture Policy.

4. Arctic Urban Design

"the most important principle is to integrate, rather than isolate, people with their environment. Living with winter not in spite of it should be the planners' motto"

Pressman, 1996, p. 525

As described in the introduction, most literature on arctic urban design revolves around two layers: culture and design. The subject covers a wide spectrum of academia, from architecture, urban planning and urban design to sociology, anthropology, physiology, psychology, and history. Where not all relevant literature will be covered in this paper, the most notable works in arctic urban design do address one (or both) of the aforementioned, two layers:

A. Discussions on what constitutes arctic living, particularities of northern cultures, challenges, and potentials specific to the arctic region and how these manifests in the urban landscapes and the needs and priorities of the local population.

B. Empirical investigations of how cultural and human needs and priorities are synthesized with practical solutions to climatic challenges and opportunities, ensuring functional and aesthetic, locally bound, relevant urban developments.

In the following chapter, these two layers will be addressed, divided into three subsections, based on a literature review of the published academic work done in the field of arctic urban design:

1.1 Investigating arctic living and the reasoning behind arctic urban design.

1.2 Understanding the conceptual use of arctic urban design in winter cities

1.3 Discussing practical applicability of arctic urban design in winter cities.

Designing for arctic living

The impact of urban space design on cities has been analyzed and debated amongst designers and academics for years. Influential literature, such as Jane Jacobs' *Death and Life of Great American Cities* from 1961 and Jan Gehl's *Life Between Buildings* from 1971, analyze and argue for the importance of public spaces in urban areas (Jacobs, 2016) (Gehl, 2011). To understand why there is a need for a regional design vernacular for the arctic, it is important to understand what challenges arctic urban design is a response to, and what actors are involved in the discussion of the topic. One of the largest advocates for arctic urban design has been the Winter City Association, publishing numerous papers on the subject until its dissolve in 2005, and starting cross-country seminars for planners in winter cities (Chapman et. al., 2018). Historically, climatological considerations in urban design and architecture were championed by the architect Ralph Erskine more than 70 years ago, and Erskine worked with urban design and architecture adapted to the arctic climate for most of his career. Despite the undeniable influence of Erskine, Jacobs and Gehl, this paper focuses on more recent literature, such as the theoretical and empirical work done by the Winter City Association, investigating the connection between arctic cultures and contemporary urban development praxes and its argumentation for winter-oriented development. The Winter City Association introduced the idea of a common northern identity in the 1980s, analyzing cities in Canada, Sweden, Norway and Japan, to understand the underlying cultural particularities of winter city communities, the infrastructural priorities, the needs of the local populations and the relationship between the local architecture and social life (Pressman, 1995) (Pressman, 2004).

President of the association, and key author on the subject, Norman Pressman, based his work on arctic design in his analyses of the relationship between the natural environment and the local populations, discussing the local perception of winter through art, poetry, traditions, travel habits, social activities, sports activities etc. Pressman's empirical studies highlight the many-faceted ways in which inhabitants of winter cities engage with the snowy landscapes, the cold, the darkness, and the wind. It is argued that winter cities have specific challenges and opportunities found only in the arctic climate. Challenges found in the winter season of cold cities are, amongst other things, increased costs for snow management, increased health expenses and mental health issues, decreased mobility, limited outdoor activity, reduced efficiency of public transportation, increased heating costs, and a general lack of color in the landscape (Pressman, 2004). Conversely, winter cities also have opportunities not found anywhere else. Many industries hold potentials for innovation, such as snow removal, energy production, construction, clothing, transportation etc. Likewise, outdoor sports: ice hockey, cross country skiing, ice skating; greatly unique, seasonal landscapes, ice and snow art/festivals, and seasonal activities are strengths of the winter cities (Pressman, 2004). The cultural activities that Pressman (1995; 2004) highlight are the ones happening not in spite of the conditions, but because of them: Finnish sauna, winter festivals, lighting installations, ski jumping, ice skating, snowman building etc. Although inhabitants in winter cities are conditioned to the harsher climate, and are argued to have a more accepting view of the cold, wind, snow and darkness of the winter months, time spent indoor in the course of a year is significantly higher in winter cities compared to cities in more temperate climates (Pressman, 1995). Winter is a big part of socialization, whether it being its unique recreative possibilities, or its limiting, harsh climatological conditions. Understanding the cultural relationship to the season in northern societies is therefore essential, as it helps qualify design solutions and warrants a much needed shift in planners' and designers' perception of winter (Pressman, 1995) (Pressman, 2004) (Shao & Wenbo, 2012).

Pressman and the Winter City Association's emphasis on the need for a perceptional change of winter covers a wide range of considerations, from transportation to tourism and industry to urban space design

and architecture. Adapting the approach with which a city is designed to focusing on the relationship between the arctic climate and the human experience of living in it not only increases the quality of life for the locals, but creates unprecedented marketing and business opportunities for everyone involved with living, playing, visiting and servicing an arctic city. A city that is economically, socially and physically adapted to the arctic climate will be more coherent, more well-functioning and more convincing for both residents and visitors alike. A city with an increased sense of place will also have stronger foundations for activities within recreation, business, education, living, culture, health and tourism, furthering innovation and prototyping within these realms of urban life (Pressman, 2004).

Investigating the implementation of winter-oriented development frameworks in all of these departments of urban development is however outside the scope of this paper, which will focus on frameworks for public space design, to increase the quality of public spaces for casual socialization and recreation in the winter. Planners and designers acknowledge the opportunities found in rural winter landscapes, both for recreation, exercise, and social interaction, but this appreciation for the arctic winter does not translate to urban development. Being exposed to the wind, cold and snow in relation to e.g. skiing, hiking and hunting is an integral part of the experience and perceived as ways to engage with the winter, as well as the winter conditions can be integral parts of larger, planned events in the urban centers (Pressman, 1995) (Pressman, 2004). However, urban space design in many cold cities is not made for winter use, as the season is perceived as too cold, dark, and inhospitable for casual recreation and socialization. Consequently, urban space design in winter cities are often planned and designed for the warmer months of the year, where the weather accommodates design for temperate conditions, leading to many public spaces being subject to standardized design solutions, as found in more temperate climates (Pressman, 1995) (Pressman 2004). The issues raised about standardized urban design is a general lack of cultural context, seasonal adaptability, and functional flexibility. What this translates to in the context of a winter city, is the beforementioned inability of urban designs to frame and afford the opportunities found in cities with a long winter season, and inability to alleviate the discomforts. Where a lack of contextual value in urban design generally is problematic, insufficient adaptability and seasonal flexibility is of particular concern in winter cities, as outdoor, casual recreation and social life in the colder months require the built environment to provide a certain level of thermal comfortability. This is what leads to public spacing, well-designed and popular in the warmer months of the year, to be inadequately geared for the drastic change of weather in the winter, autumn and spring, with the consequence of the space being largely unused for most of the year (Pressman, 1995) (Pressman, 2004; Pressman, 1991) *(*Hong & Cun-Yan, 2017*)Climate Comfortable Conditions)*. Underperforming urban design is not unique to cities of harsh climate conditions, but functional and aesthetic issues in urban spaces are often exacerbated in cold climate cities, decreasing performance of poorly designed urban spaces even further (Pressman, 1995) (Carmona, 2016) (White, 2016.) (Lawton & Punch, 2014)(Magalhães & Carmona, 2006) (Ebrahimabadi, 2015) *(Integrating Microclimate Factors in Urban Design)* (Mills, 2006*)*. A concerning consequence of underperforming urban spaces, is the move of casual recreation and socialization to indoor spaces. As inhabitants of winter cities already spend significantly more time indoor compared to inhabitants of more temperate cities, further indoor socialization and recreation can have adverse physiological and psychological consequences. Indoor recreation is not inherently negative, but there needs to be a balance between indoor and outdoor activities, and activities in the two settings should be complementary, rather than in competition. To illustrate, the possibility for indoor social activities for the oldest, youngest, and physically disabled members of society, for whom strenuous, physical activity can be unrealistic, is vital. Conversely, a lack of easily accessible, outdoor, casual socialization and recreation in winter for the same members of society can prove problematic in terms of mental and physiological health (Pressman, 1995) (Pressman, 2004) (Stout et. al, 2018)) (Chapman et al., 2018) *(Ebramihabadi, 2015)* (Zrudlo, L.R. 1988*)* (Pressman, . n.d*).*

If the offset for urban space design is shifted from a focus on summer activities to the conditions and activities found in the winter months, climatological considerations can become a naturally integrated part of the process, from initial idea to conceptualization to finished design. Where designs for warmer months are often challenged in terms of utilizing the opportunities of winter, providing shelter and functional usability, a winter-oriented urban design will provide amble opportunity for shelter year-round, for recreative and social use. Understanding and strengthening the positive aspects of winter in an urban space, while sheltering from the negative, will also make it easier to frame and support the social and cultural values of a place, making integration into the existing urban context easier (Pressman, 1995) (Pressman, 2004). As the harsh winter conditions require stronger conceptual considerations for shelter, safety and comfort, urban designs that frame and afford activities or casual recreation and socialization in winter will do so in the marginal seasons and summer as well, where comfortable conditions are easier to obtain due to the milder weather conditions. Shifting the offset for urban designs to winter does not however entail the design processes to solely focus on the conditions found in this season. As the opportunities found in different urban spaces can change from one season to the next, alongside the needs of the users, creating seasonal design solutions can ensure the relevancy of an urban space year-round. Understanding what opportunities and challenges are present in an urban space depending on the season will give a better insight into the potentials of the space, from season to season (Shao & Wenbo, 2012) (Pressman, 1991*)*. One study argues that the comfortable outdoor days pro anno can be increased by up to 30% through implementation of proper sheltering (Chapman et. al., 2018; Pressman, 2004), but there are dissenting views, with one paper arguing that comfortability levels in winter cities is more dependent on clothing choices rather than design interventions, and that designing for the marginal seasons of spring and autumn is the best solution for extending the outdoor season in winter cities (Hong & Cun-Yan 2017). Nonetheless, most literature debating arctic living and cities located in the arctic climate have consensus on the necessity for winter conditions to be an integrated aspect of urban development in winter cities, alongside an increased focus on local values and cultures.

Building upon this introduction to the problems of inadequate planning and design in winter cities, and the academic basis for rectifying it, the following section will investigate how the understanding of culture and challenges in winter cities is synthesized into concepts and frameworks for urban development in the arctic climate.

Arctic Urban Design for urban space development

Arctic urban design covers a large spectrum of inadequacies when it comes to improper developments in winter cities, from transportation systems to playground design. Although this paper focus on urban space design, it is imperative to investigate and discuss conceptual ideas and practical solutions across both large and small scale, as the success of arctic urban design comes from the cumulative effects of its interventions, across all scales: from city-wide planning to individual project. As described in the previous chapter, the academic work done in relation to urban space design in winter cities criticize the tendency for standardized urban space design to be insufficient and out-of-place in the arctic region, in terms of meeting climatological requirements and cultural values. Changing the urban design approach to a winter-oriented framework means more than adopting considerations for the seasonal climatological circumstances in the individual project. Creating meaningful winter-oriented development require plans across all levels of urban development, from city-wide masterplans to local design plans, to integrate concepts and techniques that ensure human comfortability levels in winter, and rooted in local cultural, biophysical and economic conditions (Pressman, 1996) (Pressman 2004). As such, arctic urban design can

function as a design framework for development in both the macro- and the micro levels, with winter-oriented development on the macro scale setting the framework for the individual urban development projects discussed in the final chapter.

City level

As most contemporary literature on arctic urban design focus on a scale of building, building block or neighborhood, discussions on arctic urban design in a city-wide scale is limited. Historically, city-wide design based on a winter-approach was done in projects such as Ralph Erskine's Resolute Bay, with the local climatological conditions such as wind, snow and natural light being the basis for the overall urban planning and design of the town (Jull, 2016). What is important to note is that climatology was the basis for the Resolute Bay project. Most contemporary work on city-wide arctic urban design has been investigated by Pressman (1995; 2004) (Pressman, 1996), who emphasizes the importance of arctic urban design across scales, from the city-wide policy making to the individual development project. The most important aspect of arctic urban design on the macro level is the notion of adopting a winter-oriented discourse on a plan political level, and amongst developers, investors, and other urban actors. As such, the discussion of arctic urban design on a city-wide level is a continuation of the discussion of the inadequacies of standardized urban design in winter cities, and emphasizes the need for radical readjustment of professionals' understanding of winter.

Framing the urban winter

Creating a climate-sensitive approach to urban areas situated in harsh climates is crucial to ensure the well-being and quality of life of the residents and the functionality and aesthetics of the cities in question. Winter cities need to approach planning based on the strengths and opportunities of the culture and climate found in winter, solve the challenges in accordance with conditions and minimize the negatives. An essential aspect of arctic urban design is therefore approaching the harsh conditions as part of the design framework and integrate it in the design processes and solutions (Pressman, 2004). As argued by Pressman, both public and private development strategies and action plans for arctic regions must envision and exhibit planning and design prototypes that embrace harsh winter conditions and integrate seasonality and prevailing cultural values. According to Pressman, architectural trends and fashions, legislative norms, administrative frameworks, political priorities, and economic dictates are powerful forces shaping our urban environments and factors usually insensitive to climatic considerations and the attributes of place (Pressman, 2004). If architects and designers, developers, investors, and local actors are to adopt a winter-oriented development culture, the authorities must prioritize it in their own policies and in architectural competitions (Pressman, 2004) Pressman, 1996). Pressman argues that the field of urban studies is lacking theory and empirical data on how to build sustainable and comfortable cities in the northern regions of the world with an especial need for better design frameworks that encourage a focus on healthy and rewarding climate-responsive communities. What this means is an integration of winter conditions into the fundamental way architecture and urban design is approached: Urban spacing, function, aesthetics, mobility, scale, sociability etc. Essential to this idea is the notion of a holistic approach to industrial design, urban design, architecture, infrastructure, function, and form. As Pressman states, the built environment should not be perceived as a string of individual objects, but as part of an interlinked whole; interior design relates to the building, buildings relate to the neighborhood, neighborhoods relate to the city and the city relates to the landscape. (Pressman, 2004). On a city-scale that means the direct link between land-use,

density, compactness, form, function, and mobility. For these considerations to be effective on a project scale, and not only remain theoretical debates, politicians, policy-makers, planning professionals and local actors need to push for "cold-climate" design standards that promote and encourage the application of both theoretical and tacit climatological know-how in urban development (Pressman, 1996). As such, the debate and understanding of the need for climate-sensitive design cannot remain an issue solely within the planning authorities, but must be adopted by developers, builders, design professionals, local actors and the local population. The local authorities must adopt climate-sensitivity into their policies, by centering revisioning master plans and by-laws around bioclimatic design considerations, create design guidelines for development and create climate-oriented performance standards for competition programs, with emphasis on both outdoor- and indoor design. Furthermore, development projects should be subjected to professional and planning review, to ensure that the given design is made in accordance with the strengths, challenges, opportunities and goals of its context, the local conditions and the changing seasons. Providing incentive and advantages for builders and developers to create climate-sensitive designs can assist in changing the discourse surrounding urban development in winter cities (Pressman, 1996)

Winter-oriented development

To understand why it is important for all urban actors to adopt a winter-oriented development culture, first it is important to understand that winter city development must be done holistically. A good example hereof is mobility planning. Mobility planning in winter cities is directly linked to land-use planning and policies on urban culture, such as car-free streets and soft mobility. Conditions for soft mobility, walking and biking, are poor in the winter months, with decreasing temperatures, increased winds, low amounts of natural light and icy sidewalks. The distances locals are willing to undertake on foot or by bicycle are therefore short, with longer trips being done by means of either private transportation or public transit. Frameworks for public- and cultural institutions, recreative spaces, downtown areas, offices, and housing in winter cities therefore must consider proximity and accessibility in relation to soft mobility and public transportation systems. Distance in winter cities is an important aspect of the urban fabric, both in terms of transportation infrastructure and soft mobility, but also in terms of density and land-use: urban sprawl contra urban infill. As argued by Pressman (2004), focusing on infill development will reduce infrastructural expenses for utility, transportation, and private commuting, and further increase the possibility of creating cohesion between urban elements. Furthermore, infill development supports efforts to promote and increase civic life in the densified districts and reduces energy costs for heating. As such, reducing distances in winter cities has an effect on both mobility, culture, recreation, microclimates and social sustainability. In relation to the discussion of densification, Pressman argues that mixed land-use in winter cities will support a focus on soft mobility interventions, densification, and urban cohesion, creating more lively urban areas due to a higher number of diverse functions. Planning for mixed use: shopping, housing, education, winter festivals, sports activities etc. to be accessible by foot will decrease distances, thus minimize need for private transportation, increase urban coherence and promote civic life in the winter month (Pressman, 2004) (Pressman, 1996). An example of such as approach can be found in the Swedish city of Luleå, situated just below the arctic circle, with Pressman focusing on the city's ability to "contain" the lengthy climatological conditions of winter, while "enjoying" them. The city has been discussing "winter comfort" for decades, and implemented a master plan that prioritize mixed land use and activities, high-quality public transit, heated bus shelters and sidewalks, car-free streets etc. Aesthetic work with ice- and snow sculptures, light installations and fireplaces illuminate and frame the winter setting in the downtown area, utilizing the snow and darkness to promote winter city culture (Pressman, 2004).

Where conceptualization of specific installations is not in the scope of the city-wide masterplan, winter-oriented prioritizations and implementations on the larger scale is a prerequisite for coherence on a district- and neighborhood scale, and act as guiding principles for small scale interventions. Furthermore, a holistic, winter-oriented plan for city development will strengthen the regionalism of the city and can help create a unique coherence between the winter landscape, housing, transportation, social spheres, tourism, transportation, education, industry etc. (Pressman 2004). Mapping the climatological factors in winter, such as dominant wind directions through the city, sun pathing, distances between important cultural institutions and tourist attractions, as well as main transportation lines, can provide the planning authorities with knowledge of the city's overall infrastructural and urban coherence, for the season that is most challenging in terms of climatological conditions, mobility, outdoor stay etc. Matching climatological values of temperature, wind, sun, snow and rain with the position and coherence of a city's infrastructure, institutions, housing areas and cultural values qualifies the process of selecting urban areas for development, and which are most vulnerable and thus least favorable (Pressman 2004). It can therefore be argued that microclimate assessment on city-wide scale is investigative and diagnostic, rather than the basis for intervention and design, as it is on district and project level.

Although city-wide policies can be expected to remain rather abstract while identifying the long-term goals of a winter-oriented development, it is essential that the prioritizations for winter-oriented development can be transformed into physical form on the smaller scale, i.e. in masterplans, design guides etc. (Pressman, 1996) If performance standards are set on a city-wide scale for transportation, land-use and project cohesion, winter-oriented development could be argued to benefit winter cities year round, as a focus on mix land use, urban coherence and soft mobility creates more dynamic cities, regardless of season (Pressman 1995) (Pressman 2004) (Gehl, 2010) (Gehl, 2011) (Adams and Tiesdell, 2013). That being said, seasonal differences in winter cities are significant, especially from summer to winter, with shifting opportunities and challenges in terms of space functionality and aesthetics (Pressman 1995) (Pressman 2004). As such, winter-oriented planning on a district/neighborhood level emphasizes the need for seasonal planning, with an increased focus on seasonal functionality and aesthetics, which amongst other areas of intervention, will be discussed in the following section.

District / Neighborhood level

Continuing arctic urban design for city-wide planning, the district level address concepts of climatological- and cultural design considerations. Across the literature of arctic urban design, the notion of climate-sensitive, seasonal design is discussed and emphasized, with different scales demanding different considerations and interventions. As such, city-wide planning for land-use, mobility and density will greatly affect microclimate- and space design efforts on the district level, and the project level. Climate-sensitive design on a district and project level is described as *bioclimatic design*. Likewise, planning and design done in accordance with local culture and values to create meaningful design is discussed under different terms, such as "place-making" and "space shaping", and is gathered under the notion of *genus loci*, the spirit of the place. Where most contemporary literature on arctic urban design focus on the bioclimatic aspects of developing in winter cities, Norman Pressman's argumentation for the understanding and design for winter city culture is considered to be as important for arctic urban design frameworks as the climatological considerations.

Bioclimatic Design

To improve quality of life in winter cities, the arctic climate must be an integrated aspect of both planning and design. Bioclimatic design, which is at the center of arctic urban design, is the creation of climate-responsive design, based on a winter-oriented urban- and architectural grammar. Bioclimatic design therefore employs a wide array of climate tempering considerations that can, if applied correctly, accentuate the beneficial aspects of a site, while reducing or removing undesirable conditions (Stout et. al, 2018). Utilizing bioclimatic design in rooted in a climatological investigation of site selection and planning, urban density and form, natural- and modified topography, orientation, urban space characteristics, vegetation, location of openings, materiality and surface colors (Pressman, 1995) (Pressman, 2004). Likewise, Pressman emphasizes the importance of the potentials of the built environment to affect microclimate. Dense urban areas and building clusters tend to have a big impact on the surrounding microclimate, as well as high-rise buildings, with negative consequences such as increased wind speeds, turbulent winds, unwanted shade and lower temperatures

Understanding the existing microclimate of an area prior to the design phase, through climate simulation modelling, will give a better qualified process in terms of discussing urban form, density, function, typology, mobility, recreation, and infrastructure. Analytical tools such as mapping techniques for wind, sunshine, shade, rain, snow and temperature can also assist conceptualization and design phases for development projects, and visualize opportunities and challenges within design propositions. Utilization of analytical techniques for mapping microclimates and climate parameters such as a will further. Understanding and appreciating the importance of microclimates in the early stages of conceptualization and design will enable designers to create pleasant urban areas, where building and urban space complement one another in a coherent transition from outdoor to indoor. (Zrudlo, L.R. 1988) (Watanabe et. al, 2016) (Watanabe et. al, 2017)(Meng & Setoguchi, 2010) (Yang, F. 2017) (Chapman et. Al., 2018) (Ebrahimabadi, 2012) (Hong & Cun-Yan 2017)

As mentioned in the introduction to the chapter, one of the essential aspects of arctic urban design is extending the outdoor season in winter cities, so outdoor recreation and socialization in the urban setting is possible for an extended period of time (Pressman, 2004). For the outdoor season to be extended, understanding how to manipulate the microclimate to ensure thermal comfortability in the coldest season is essential. Maximizing direct sunlight on buildings for work and habitation while reducing shade cast onto surrounding public spaces is an example of interventions where a focus on winter can enable planners and designers to make informed, coherent decisions for both urban space and building, and create the best possible design based on the least favorable conditions (Pressman, 2004). Ensuring the best microclimate conditions is especially important for recreative spaces, as the functionality is highly dependent on a utilization of the climatological opportunities and the reduction or elimination of climatological challenges. As such, spaces need protection against wind and rain, as well as optimizing direct sun, and designing for darkness, snowfall and ice. Doing so through clustering buildings, using windscreens, vegetation, snow fences and designing for compact, coherent spaces with the natural landscape, microclimates can be improved to a level that makes summer activity such as outdoor stay possible in the winter months (Pressman, 2004). Microclimatic considerations on a district scale covers not only spaces of stay and activity, but also the connective networks of footpaths, streets and dwellings, both in the districts themselves, but also connections between districts. Designing networks of mobility and dwelling for mitigation of strong winds while maximizing passive solar gains will create urban networks that are also comfortable using in the winter and strengthen urban coherence through all seasons (Pressman, 1996).

Understanding and designing for the microclimate in an urban space design does not however limit itself to the broader climatological considerations like temperature, wind speeds, snow deposition, direct sun

etc. Understanding less obvious conditions like air quality, noise pollution and humidity can have effects on the functional and aesthetic value of a design (Pressman, 1995) (Pressman 2004) (Chapman et. al., 2018). Active and passive recreative spaces should be arranged, equipped, oriented and sheltered in a manner that ensure warmer zones during the months of winter, and cooler zones during the summer. Likewise, enabling users the opportunity to choose whether to be exposed or protected from the essential aspects of microclimate, such as direct sunlight or wind. Depending on the intended activity for the area, urban space design solutions and the buildings need to be designed to ensure an optimal microclimate throughout the area, whether exposed or protected from direct sun (Pressman, 2004). Building upon the discussion of utilizing the opportunities and reducing the negative climatological conditions, the notion of an "optimal" microclimate is dependent on (multi)functionality of the urban space, as some would need wind protection while others would be centered around the unhindered forces of nature (Pressman, 1995). Creating a good, bioclimatic design therefore also depends on questions of architecture and design, discussing matters of function, form, color, shape, and scale of future development projects. Understanding the direct link between planning and design of a space on the quality of the intended activities, so will the quality impact optional and spontaneous activities. If a space is both climatologically and aesthetically comfortable, it is more likely to afford optional activities, whether large or small. Conversely, if a space is of poor quality in terms of aestheticism and comfortability, the level of activity will be reduced to necessity (Pressman, 1991). Actively discussing what constitutes comfortability in a space, depending on the anticipated activities, will enable planners and designer to engage in a creative process of finding potentials, and determining what kind of protection is

Likewise, understanding how to utilize the environmental dynamic between indoor/outdoor in an urban space will further qualify solutions for creating an optimal microclimate, and afford more types of activities. Bioclimatic design is not exclusively used for new developments but can also be used as a driver for retrofitting. As such, arctic urban design can be used to revise policies and regulatory instruments to better include climate-sensitivity in repurposing urban areas, and combat exacerbated microclimate conditions such as wind tunnels, snow allocation etc. (Pressman, 2004)

Bioclimatic design is however not a "one-size-fits all" approach to urban design. For designers to be able to determine what microclimate to design for, it must be determined what functional and aesthetic uses the outdoor urban space must afford. When debating the insensitivities of international design trends towards climate and culture, Pressman argues that many buildings and neighborhoods epitomize "placelessness", as they are identical in material use, site exploitation, isolation from cultural value and the landscape. Approaching urban design from a purely bioclimatic perspective is inadequate for creating meaningful urban design, as climatological considerations do not consider cultural values, identity, user needs etc. As such, bioclimatic design solutions risk being contextually lacking in terms of functionality and cultural relevance.

"*What has resulted is more often a steady-state, thermally neutral environment (constant temperature and humidity regardless of natural conditions) where "indoors" and "outdoors" are no longer connected or related.*

Pressman, 1996, p. 522

Addressing "placeless" design, considerations for local values, needs and aesthetics has led to theoretical consideration of *genus loci,* the spirit of the place (Pressman, 1995). To qualify bioclimatic design for the urban- and cultural context it will be a part of, climatological design solutions must be made based on needs and opportunities in the given context (Pressman, 1996).

Place-shaping / Place-making:

The idea of debating and conceptualizing place-making is rooted in the problematic developments of placeless urban design, as discussed in the section on designing for arctic living. Place-making in of itself is not exclusive to the debate on arctic urban design but is a field of research in of its own, with researchers investigating debating what constitutes good urban space design, how to turn a space into a place of meaning, and what processes lead to it (Adams and Tiesdell, 2013). Attractive and inviting urban spaces, and the activities they afford, both planned and spontaneous, are at the essence of urban life. The configuration of public spaces, their affordances, symbolic values, connection to surroundings, meanings and identities are highly influential to the quality of urban life (Pressman, 2004).

As urban designs in winter cities must incorporate microclimatic efforts in conceptualization and design, synthesizing bioclimatic design and place-making enable planners and designers to utilize local culture, identity, needs, challenges and opportunities to ensure relevant functionality, scale, coherence, aesthetics, materiality etc. in urban space designs. As such, outdoor urban designs rooted in bioclimatic designing, but not in locality, will not provide meaningful urban spaces, compared to designs synthesizing bioclimatic design and place-making. The goal of creating locally bound, relevant and well-designed spaces is for the needs of the users to be met, and for the design to elevate the space in the minds of the (Pressman, 1996). General considerations for safety, social equality, clean air, community involvement etc. are virtually universal when seeking to make good place-making, however, winter cities hold regionally specific considerations that must be adhered to, to ensure successful place-making. Furthermore, understanding the connection between culture, microclimates and seasonality is important for winter city design. At the core of place-making is the pursuit of creation a design that elevates the public area in the minds of locals, anchoring the place in its urban context and making locals proud of their public (Pressman, 1996). This goal stands in sharp contrast to the consequences of standardized urban design, where a given design's relation to its context is often lacking, both in terms of aesthetic expression and functionality. In relation to the problematic nature of standardized urban designs, urban spaces must be genuinely public, understood as open and inviting to social recreation by all members of society. The notion of "genuinely public" stands in contrast to the increasing privatization of public space, creating pseudo-public spaces operating based on private interests, such as shopping malls, with limited access for certain social groups. (Pressman, 2004). In relation to a shift from public- to quasi-public realm, it is argued that contemporary design professions lack a focus on creating spaces based on individual and cultural needs of the users, and that empirical data on urban space behavior is insufficient in terms of creating a clear image of how the physical form influences users' behaviors and needs (Ahmad et. al, 2011)

As the approach to place-making is project specific, it is difficult to create a framework suitable for every project, but as the goal of place-making is to invoke an emotional response with locals, and to create an attachment to the place, the process from idea to finished design must incorporate solutions sensitive to local values and conditions. For winter cities, that includes a rediscover and emphasize on problem solving that is rooted in the natural landscape, the climate and the seasonal differences. Planning and designing in winter cities therefore requires professionals to determine and consider the overarching values of a place, understand the setting, issues and potentials and create a design that synthesize them with practical solutions (Pressman, 1996). For existing urban spaces, short term installations can demonstrate how best to utilize potentials of an area, and gather support for long-term developments, whether small- or large scale. As argued by Pressman (1995) knowledge of place-making and climate-sensitive development must

be turned into fathomable and applicable standards and tools for research, analysis and design for winter cities.

As described above, understanding the dynamic between cultural values, microclimatic conditions and seasonality is important for urban designs to be successful in winter cities. Based in the argument that winter conditions should be the outset for urban design in winter cities, the shifting challenges and opportunities in the individual seasons must be thought into a multi-functional and multi-seasonal design.

Seasonality

Bioclimatic design is rooted in the opportunities and challenges found in the dynamic between the natural environment and the built. As the natural environment is never static, design solutions must be made in accordance with the dynamics of the natural environment, both in terms of daily changes, weekly and annual. As such, for the functional and aesthetic aspect of a bioclimatic design to be optimal, the design must be able to and adhering to the very different opportunities found in the different seasons of the year means designing for a change in day and night, weather and season (Pressman, 1996).

Day/night: The daily cycle of day and night makes for significant changes to the expression of urban spaces, with differing potentials and challenges dependent of the available natural light. Due to the relatively longer periods of low natural light in winter cities, urban spaces in will have to utilize and incorporate the possibilities found in a setting of low natural light.

Weather: Storms, rain, wind, fog, blue skies, sunshine etc. As the weather changes, so will the expression of the urban landscape, and the bioclimatic design solutions should evaluate the intensity of use depending on weather and emphasize solutions for all weather patterns.

Seasons: The annual cycle of Winter, Spring, Summer and Autumn holds greatly different aesthetic and climatological features. For winter cities, the months of Spring, Summer and Autumn are known for their colorful landscapes, while winter is known for a relatively monotonous "whiteness" due to drab weather, low amounts of natural light and snow cover. As with daily- and weather changes, bioclimatic design solutions should be adaptable to changing seasons, offering different sensory- and functional experiences depending on the season.

Where it can be argued that day/night considerations is more a discussion on general adaption to light/no light, most literature on the subject of designing for dynamic natural conditions focus on seasonality, from summer to winter (Pressman, 1995) (Pressman, 2004) (Shao & Wenbo, 2012*)*. (Pressman, 1996. As described in the section of arctic urban design on city level, the discussion of seasonality is central to arctic urban design, as the foundation of the design approach is rooted in a need for winter cities to adapt a planning culture that embraced and celebrates the seasonal changes in the natural- and urban landscapes. Seasonality as a concept for design will challenge planners and designers to approach urban design based on a dynamic environment, requiring flexible design solutions (Pressman, 1995). In spite of the discussion of winter-oriented development expanding the availability of outdoor stay and recreation in winter months, Pressman argues that outdoor spaces in winter cities should not anticipate an the same intensity of use all year, even when designed for creating thermal comfortability in winter, as certain socialization patterns are lower during the colder winter months (Pressman 1995) (Pressman 2004). Likewise, as travel and stay is often more uncomfortable in the months of winter, and it is important to notice that standardized design does not afford "hanging out" in winter months. In contrast, where passive recreation is often less frequent in months of winter, many winter cities see a tendency for activities in urban spaces

to more diverse, as the winter condition of snow, low temperatures and wind seem to suspend social norms, and users define the use of such spaces in a new fashion, like ponds becoming ice rinks (Pressman, 1991)

Addressing urban space design as a way to transform a space to a place, bound in local values, opportunities, needs and conditions will elevate the quality of life in winter cities, and create an urban environment that functions with winter, instead of in spite of. To understand how climatological and cultural values are synthesized in winter cities, the following section will look at specific design interventions in winter cities highlighted by researchers in the field of arctic urban design.

From concept to applicable practice

To understand the transition from theoretical discussion on winter city planning to a practical application, it is relevant to investigate the micro level, the specific projects. Considerations for bioclimatic design and place-making on city-wide and district level betrays a clear discourse on urban development as in need for cohesion in planning and design, as successful urban space design in winter cities require a persistent bioclimatic- and place-making approach, from all actors involved, from the local planning authorities to the developers and urban designers. Investigating the practical design solutions highlighted by researchers of winter cities, betrays how they envision the theoretical work best materialized. As such, the following chapter investigates planning and design examples, and discusses practical arctic urban design tools for use in winter cities, to ensure good urban space design.

The practical solutions for winter-oriented urban space design revolves around the synthesis of winter city culture, and the bioclimatic considerations that will help frame the activities, values and possibilities that are afforded. When designing winter-oriented urban spaces, creating shelter from dominant winds, ensuring proper lighting and managing snow are the three most important considerations (Ebramihabadi, 2015). Designing urban spaces for winter-oriented use, designers need to consider what level of protection best suits the intended connectivity, uses, expression and scale. For high-use areas, Pressman (1995) argues for a high level of protection through interlinked pedestrian networks between shopping, schools, cultural centers and transit stops, through the use of gallerias, arcades, passages, canopied pavements. The use of indoor pathways for protection against the winter conditions is however not supported by all researchers. A study on urban design guidelines based on wind tunnel simulations concluded that arcades in winter cities exacerbated local wind speeds at the base of the building, forcing winds through the arcade, which would not be considered an issue in temperate climates, but would prove problematic in winter cities, when designing for comfortable wind speeds and temperatures. (Meng & Setoguchi, 2010*).*

Creating sheltered pedestrian networks and settings also require winter-based standards for handrails, ramps, stairways, curb detailing etc. as it will improve mobility for the elderly, physically impaired and young children, for whom mobility in winter can be challenging (Pressman, 1995; Pressman, 1996). For areas where protective solutions are not an option, pedestrian/vehicular free zones with non-slip surfaces will make more sense than conventional streets in downtown areas. Increasing commuting by foot has health benefits and a city's carbon footprint. In contrast to protected pathways with non-slip surfaces, another use of mobility infrastructure is the creation of ski-trail networks. Cross-country skiing is a big part of many arctic cultures, with skiing in the landscape outside of urban areas being a cultural pastime. Creating vehicular-free streets would open the possibility for commuting by cross-country ski to be an alternative to vehicular commuting. Furthermore, designing for skiing to become an integrated part of the urban landscape, amenities for recreative skiing in public spaces such as ski jumps and half-pipes can create

globally unique settings in the urban context, and help introduce skiing to a younger audience (Pressman, 1996). Where outdoor, active recreation in winter holds a great amount of potential, the harsh climate also creates a precedence for fully protected spaces, for the members of society, unable to participate in outdoor, active recreation. Following the argumentation for protected networks for soft mobility, a part of winter-oriented design focuses on the notion of creating indoor landscapes that are generally found outdoors. Winter-indoor gardens is an example of a climate-controlled park that ensures year-round accessibility to recreative garden areas, eliminating the harsh weather conditions of the winter months. By planning and designing an indoor garden for the main floor, the structure can be intimately linked to the outdoor, and opens the possibility to design soft transitions from indoor to outdoor. In outdoor urban spaces, flora is used to lower local wind speeds and lowering noise pollution, and thereby produce better localized climates (Pressman, 1996) (Mills, 2006)

Where protected, indoor areas hold great opportunities for visual stimuli, as the interior and function does not require sturdy design, designing outdoor public spaces for winter usage require extra considerations for scale, decoration, infrastructure, and connectivity. As argued on district level considerations for urban space design, multi-seasonality and must be the outset in winter cities. For urban space designs to be useable in the winter, they require a bigger emphasis on visual stimuli, and the short days of winter and monotonous white landscapes sets an unprecedented need for well-designed, culturally relevant visual art. Utilizing color schemes for both buildings and installations, as well as local art such as sculptures, local murals, graffiti and lighting installations can ensure both visually stimulating spaces, but also frame activities and the general functionality of the space. Utilizing lighting design, in collaboration with physical installations, for both functional and aesthetic reasons can create better coherence in the dark months of winter, where paths and urban spaces are dependent on lighting installations for most of the season. In the same way, lighting installations such as log burning fireplaces can be of great value in urban spaces, as they both provide functional light, but also adds value to the space in terms of atmosphere and heat (Pressman, 1996). Creating well-designed urban spaces also require thermal comfortability, to ensure stay areas where installations, urban furniture and embellishment seeks to frame the public sphere for socialization. To create thermally comfortable neighborhoods and urban spaces, orientation and building grouping is an important consideration. Well-designed building enclaves can redirect winds away from courtyards and urban spaces for stay/activity. By analyzing the direction of the prevalent winds, which for winter cities is often east/north, building groups can be orientated and designed to have closed facades facing east/north, while opening up towards the south and being low scale, increasing the level of natural light in the public areas. Utilizing a general south-facing orientation of both building- and building groups also include private outdoor areas, balconies etc. where a maximization of sunlight will elongate the season of comfortable use Pressman, 1995) (Pressman, 1996) (Stout et. al, 2018)). Windscreen buildings, understood as buildings perpendicular to the prevalent winter winds, can be an optimal outset for designing bioclimatic housing areas. Planning for windscreen buildings towards the prevalent winter winds, placing outdoor living areas leeward and facing them southwards will create the best conditions for winter comfortability. Designing buildings to contain indentations on the leeward side of the building, facing south, creates the possibility for small “pocket park”, bioclimatic spaces that will have greatly improved microclimates compared to urban spaces located around and between large constructions (Pressman 1995).

Creating windscreens is also highly useful in public areas. Use of fences, benches, artificial slopes, wooden installations etc. as windscreens are examples of interventions that can both act as functional urban furniture in the sense of both place-making and bioclimatic design. By creating opportunity for casual socialization while providing wind protection by pushing prevalent winds upwards, relatively cheap, short term interventions can make significant improvements to comfortability in urban spaces where bioclimatic

conditions are sub-optimal. Thermal comfort analyses should be standard for design of both public squares and housing groups, and should be matched with shadow studies of buildings, to get an understanding of where wind and shade will reduce the thermal comfort levels to a level that is inadequate, and whether it warrants a redesign. Public space between buildings should not exceed 30 x 30 meters, as larger open areas will be more exposed in terms of wind, and will lose the heat-island effect generated by warm surfaces and compact construction (Pressman, 1995). Though there are different approaches to wind analyses, varying in scientific complexity, understanding that wind analyses for both individual building design and for building enclaves and urban spaces is of utmost importance for recreation, sense of place and mobility. Some studies focus on the relatively easily accessible use of the Beaufort scale for design and planning, emphasizing that design should not manipulate wind speeds to exceed 5 m/s, as 5 m/s winds are the maximum air velocity that can be accepted, if comfortability is to be ensured for stay and passive socialization. Evaluating wind comfort can be done in different ways, but a simple analytical tool is evaluating the relationship between hourly mean speeds and peak wind occurrence as the base parameter for evaluating design's ability to ensure comfortability. As an example, an area with low mean winds can still be considered uncomfortable for passive stay, if it is subject to frequent and strong wind gusts.

$Ue = U + k\,\sigma$

Ue: effective wind speed

U: mean wind speed (at 1.75 m height)

k: peak factor

σ: standard deviation

(Ebramihabadi, 2015)

Wind flow patterns are affected by the typology of the individual building, with taller structures forcing winds down along the façade and onto the ground level, increasing the general wind speeds around the building, and increasing the occurrence of wind gusts at ground level. Exacerbated wind speeds also affect snow deposition, with large areas on the leu side of tall structures seeing large deposits, while other areas see none (Pressman, 1996) (Hong & Cun-Yan 2017) (Meng & Setoguchi, 2010) (Pressman,1996) (Watanabe et. al, 2016) (Watanabe et. al, 2017) (Yang, F. 2017). Having a basis understanding of the wind conditions of an area, alongside the accessibility to solar radiation, can qualify the design and decision-making processes for both planning authorities, developers and design professionals. As high-rise construction causes turbulence at the ground level, tall structures around urban spaces will make it more difficult to obtain comfortable wind speeds in the area, as well as providing access to solar radiation in the months of winter, where the sun sits lower on the sky.

5. Revision of the Architectural Policy

With the introduction to urban development in Nuuk and the lacking design approach towards the city's urban spaces, arctic urban design is a research field that, despite its origin in North American and Swedish planning culture, contains conceptual- and practical consideration that can assist in creating a revision of the Architectural Policy of Nuuk. Firstly, it is important to realize that the practical solutions in terms of building typology argued for by the Winter City Movement is not optimal for Nuuk. Through the discussion of place-making, it is obvious that the focus on arcades, gallerias etc. are not relevant in the context of Nuuk, as the density of the city is too low for general appliance. Where arctic urban design is highly useful in Nuuk, is the conceptual idea of shifting planning from a non-seasonal approach to a winter-oriented approach, and the concept of place-making, are highly useful, as the city suffers from urban spaces that do not add value to quality of life and recreation in the city, partly due to an inadequate attention to the potentials of urban spaces, and partly due a lacking prioritization for the creation of meaningful urban design. and partly because the lack of urban spaces design in many of the public spaces causes microclimatic conditions to be sup-par for recreative activity and stay in the winter months. As such, recommendations for a revision of the Architectural Policy will revolve around the following two subjects:

1. **Place-making** – understanding of place and designing based on the local values and needs
2. **Bioclimatic design** - climatological considerations for the arctic environment

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- Figure 1, 1 Municipal plan hierarchy for Architectural Policy and master planning, own creation

Interviews:

Alle interviews er foretaget af Malthe Sabro Dolleris i perioden 26.03.2019 – 29.03.2019, i forbindelse med feltarbejde tilknyttet kandidatspecialet i Urban Design ved Aalborg Universitet.

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