Indicators as Tool for Evaluating the Sustainability of Ørestad Nord and Ørestad City

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Abstract: Developing a new city and making it sustainable at the same time is a complex matter as sustainability itself combines environmental, economical and sociological aspects. These aspects connect sustainability to both the daily city life and the urban development through numerous factors, including transportation, infrastructure and small-scale factors such as local park environments, design and sizes. In this paper two neighbourhoods in Ørestad, a new district in Copenhagen, Denmark, are studied and their sustainability from a planning perspective is evaluated using indicators that cover four areas: density, mixed land use, green areas and public spaces. The study was done as a comparative analysis of indicators for the two finished neighbourhoods Ørestad Nord and Ørestad City. The study describes the methodology of creating the indicators and presents an evaluation scale for ranking the data assembled. The data indicated differences in sustainability between the two neighbourhoods and even though the sustainability was found to be pretty satisfying, it could have been considerably higher in both neighbourhoods.

Keywords: Indicators, Sustainability, Urban Planning, Ørestad.

Introduction

Sustainability is a matter that most countries, cities, districts, neighbourhoods and individual persons have interest in, and people constantly compare their local environment with others, whether it is the adjacent neighbourhood, similar cities or other countries. It is a difficult task to compare areas or cities in terms of sustainability due the multiple factors influencing sustainability within the environmental, economical and sociological domains, and thus it can be quite difficult to obtain specific data to evaluate sustainability against.

The use of indicators as a sustainability evaluation tool can be a way of converting a fuzzy concept of sustainability into specific and quantified data with measurable units and scales (MacLaren 1996; Azapagic *et al.* 2000). Sustainability indicators are typically used for determining progress towards sustainability and can only provide indications on sustainability and not a full picture. But if the indicators reflect the three sustainability domains mentioned above, are forward looking in measuring progress and possibly produced by multiple stakeholders of the given community, they can be a solid measurement of sustainability (MacLaren 1996).

Multiple cities have developed their own tools and methods to evaluate sustainability from indicators, and among them is Copenhagen Municipality with their "Sustainability tool" for measuring of potential sustainable development in the city. The sustainability tool developed for Copenhagen consists of 14 different subtopics within the fields of social, environmental and economical domains. In the sustainability tool it is stated that a living and dynamic city is a dense city, that benefits from strategic placement of functions, public spaces and public transport, which will decrease the need for transportation. Green and blue areas should be improved in a way that increases biodiversity along with recreational areas that provide opportunities for leisure and activities (Københavns Kommune 2014). In this study, the Copenhagen sustainability tool and MacLaren's indicator method framework are used as basis for producing indicators that are used to evaluate the progress towards sustainability for the new city part in Copenhagen, Ørestad.

Ørestad is an interesting city part, since it has been a subject of intense discussions in the Danish media, involving citizens, authorities and experts. Many of the contributions to the debate have addressed the building sizes, sizes of surrounding areas and building design in Ørestad, all subjects that can be assigned to an overall theme of sustainability and urban environment of a city. In the light of these ongoing discussions, it's interesting to actually

examine whether Ørestad is developing towards a more sustainable city district and whether it is meeting some of the critique that has been pointed towards it, or not.

Ørestad as a city district is divided into 4 smaller neighbourhoods which are in different stages of development. The neighbourhoods Ørestad Nord and Ørestad City are almost completed which makes comparison of the neighbourhoods possible. The investigation of the progress towards sustainability for Ørestad in this study is thus carried out as a comparison between Ørestad Nord and Ørestad City, since it is assumed that Ørestad Nord was built before Ørestad City. The main reason for comparing two neighbourhoods within Ørestad is the fact that the district of Ørestad isn't fully developed yet. It is therefore not possible to compare it with another neighbourhood of Amager for instance or any other city district of Copenhagen. It wouldn't be fair, since Ørestad is a new city district and the other districts of Copenhagen have been developed for numerous decades or even centuries.

The evaluation of the progress towards sustainability of Ørestad is focused on the topic *land use*, which again is splitted into four subtopics: density, mixed land use, green areas and public spaces. Indicators for these four subtopics will be produced and evaluated.

Visions of Ørestad

The Master Plan of Ørestad from 1995 has been the main outline for developing the new district. The overall vision of Ørestad is to link Copenhagen city centre to the connection of international traffic passing between the southern part of Europe and the northern part of Scandinavia. The idea of Ørestad was to create a modern counterpart to the old city centre, following newer strategies for urban planning and creating the possibility for having a lot of new and modern architecture gathered in one area (Book *et al.* 2010)

To fulfil Copenhagens ambitions concerning a dense city and to accommodate all the desired functions of a city, the building percentage were set to 100%. In order to make an attractive location for businesses as well as residential housing a new metroline was planned as the main vein connecting Ørestad with the rest of Copenhagen.

Figure 1. Air photo of Ørestad Nord. Picture source: Ole Malling, By & Havn.

Ørestad Nord (figure 1) is mainly defined as a university area, since it contains the existing part of Copenhagen University's Faculty of Humanities and the IT-University. The area also contains business, residences and cultural facilities. The green areas and the canal through the neighbourhood are meant to gather students, inhabitants and business people during the days of good weather, and are planned in that way to bring life to the urban space. Ørestad Nord was the first area to be built, since it was supposed to contain some very important functions for the new city area, and to start attracting people to the new city district as early as possible (Book *et al.* 2003).

Figure 2. Air photo of Ørestad City. Picture source: Ole Malling, By & Havn.

Ørestad City (figure 2) was the next neighbourhood to be developed, since it had a very important place in the overall strategy of the Ørestad district, where the link between the Øresundsbro connection and the city centre has a crosspoint. Ørestad City mainly contains business, cultural facilities including the big shopping centre Field's and residential flats (Book *et al.* 2003).

For both areas a significant approach has been to integrate the green areas (figure 3) and the water into the urban spaces (figure 4). The green areas are seen as broad green fingers, bringing the green Amager Fælled into the built areas. The water is visible in the canal in a long nerve through Ørestad Nord and Ørestad City (Book *et al.* 2003). Buildings were designed in high quality and all with the aim of

having less than 10 minutes for pedestrians to a metro station. This means that big, tall buildings were established to create large people densities close to the metro (Block, K, personal communication, March 25, 2014).

Figure 3. Diagram of the Final Competition Winning Solution. [Interview, By&Havn], Picture source: Received by Kresten Bloch, By & Havn.

Method

Indicator Method

The method used for creating the indicators is based on Maclaren's (1996) 9-step-method for urban sustainability reporting. The method used here has however been slightly adjusted according to the purpose.This was due to the fact that the paper is an independent study, which means that data was limited and that data availability as a consequence was a main criterion when choosing the final set of indicators.

To ensure indicators that both cover a wide range of sustainability issues and can be directly measured, two different categories of indicators were identified: soft and hard indicators. Soft indicators are indicators that cannot be measured without a rather high subjectiveness. To ensure a higher validity for these soft indicators, a scale with ranking from 1 to 5 were created. The higher ranking the better indication of sustainability. Hard indicators can be measured only by numbers, but are also graded on a 5-point scale.

Numerous indicators within the four main subjects were created and evaluated. For each subject the ranking for each indicator is summed up on a radar diagram to get an overview of the sustainability in relation to the specific subject.

Data Collection

Data was collected both for background information about the planning and development of Ørestad and for the indicators. Four types of data collection methods were mainly used: literature search, data collection via online available maps (distance and area measurements), interviews and field trips (light measurements, facade evaluation, etc.). For many of the indicators, distances and areas were necessary to measure. These were measured with Google Earth Pro and the distances were measured as the air distances.

An interview with architect Kresten Bloch from By & Havn, a fraction group of the disestablished Ørestad Development Cooperation (ØDC) which started the planning of Ørestad, was carried out and used as a knowledge source for the building and planning process of Ørestad as well as the different planning choices made by the ØDC. Some of the indicators are evaluated against these choices.

A field trip to Ørestad was carried out to get some general impressions of the city parts. The different impressions were written down and pictures were taken for documentation. The light at nighttime was measured using a luxmeter-app.

Developing the Indicators

The indicators developed in this study are based on the four main areas within land use: density, mixed land use, green areas and public spaces. The sections below describe the basis on which the indicators were built and briefly explain the underlying grading scales that were used to obtain the radial diagrams, in which the indicator results are presented. In general, the specific indicator numbers and grading scales can be found in the report plus the supplementary material (Sørensen *et al.* 2014) that constitute the basis for this article.

Density

According to Jan Gehl (2010), urban density can be compared with a party: When planning a longer party you want to collect the guests and the event in as few rooms as possible, preferable at the same level. The same principle can be applied for urban planning. The people should be collected in as few "rooms" as possible with a suitable size and on the same level. According to Jan Gehl, too many and too "big rooms", that is the public urban spaces, are created in modern urban planning. As one of Jan Gehl's beliefs are that "people like to go where people are" (Hayter 2004, p. 29) he means that the "too big room"-scenario creates a situation where no people visit the public spaces as they feel deserted. So in order for people to feel comfortable in an urban space, a certain building density and people density must be present. Llewelyn-Davis (2000) express this as a

critical mass of people that must be present in order to support local shops, schools and public transport (Carmona 2010), thereby creating life. The positive effects of density thereby count ease in the access to community services and access to transport, but also things as lower energy consumption and an increased feel of safety (Carmona 2010). Peter Newman (1996) suggests a minimal people density of 30 to 40 people per hectare. A number of 2000 inhabitants can be estimated to have been present in the early organic cities in the 20th century (Gehl 2010) and can approximately be considered as an optimal value, since these cities can be thought of as ideal (indirectly expressed by Newman (1996)).

But density expressed in terms of people density is not the same as density expressed in terms of buildings. A high people density can easily be achieved through few, very tall building. But according to Jan Gehl (2010) many high buildings with big spaces around do not necessarily describe a healthy density even though the urban density still high. This is primarily related to the scale of the buildings; large-scale buildings are out of the "human scale", as Gehl expresses it (2010).

The above considerations were taken into account when developing the density indicators and this resulted in indicators, which describe the number of inhabitants, size of living spaces, building geometry and architectural footprint. Following final five indicators could be obtained through the available data: urban density, average residential area per person, number of small apartments (<60 m2), building height and building size in relation to the surroundings.

The indicators were evaluated through a 5 point scale, where a high urban density, a high ratio of small apartments (40-60%), a low building height, low residential area per person and a proper architectural footprint area were considered best and hence graded highest. The resulting indicator evaluation is shown in figure 4.

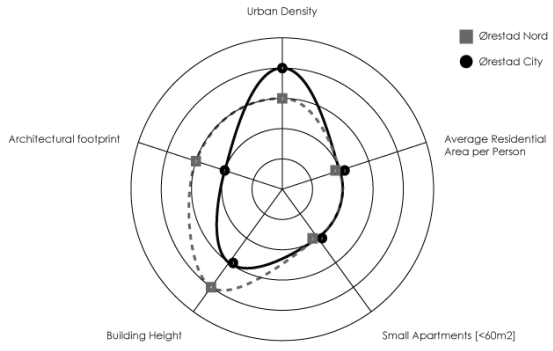

Figure 4. Result of Graded Density Indicators

Mixed Land Use

In Copenhagen, the agenda has for a long time been to take room from cars and give it to pedestrians and bikers, to create a city that is dominated by people and not cars. In relation to this, the locations of the different functions in the city are crucial factors to consider. A normal citizen can be expected to be in need of five main functions in the city in his or hers everyday life: a residence, a workplace (offices/businesses), grocery stores and public institutions and transportation if needed.

In order to invite people to walk or bike, these functions should be available within a walking distance. Peter Newman (1996) expresses a quality city like this: "the streets are filled with people walking and all major local destinations are within a short walk. The keys to this are density and mixed land use, which grow from the need to have sufficient people living nearby and sufficient work, shops, schools, etc. within walking distance". Peter Newman mentions the term mixed land use, which can be interpreted as a more or less evenly distribution of the cities main four functions throughout a neighbourhood. This is also expressed in Jan Gehl's (2010) view on scale, when he states that it is more useful to have 1 m^2 space available next to the home, than 10m^2 available just around the corner. This sums up the concept behind mixed land use quite well. All the necessary functions should be accessible locally; rather small and local functions than a larger central function cluster. Ultimately, when a dense local city with mixed land use is achieved, people can quickly move between their daily activities to an extent, where cars become unnecessary.

Furthermore, an area with a well-mixed land use has activities all day and the connected feeling of safety and the excitement of experiencing such a neighbourhood by foot are improved enormously.

Based on these observations and the principles of Peter Newman and Jan Gehl, indicators for mixed land use and its functionalities have been developed. Ten subindicators were developed in order to evaluate the mix of functions in all scales. The 10 indicators concerned the distances between the four functions: residences, grocery stores, transportation and public institutions and included the degree of mixed land use for the overall neighbourhoods and for subdivisions of the neighbourhoods, individually divided for Ørestad Nord and Ørestad City.

The indicators were graded on a 5 point scale, where short distances between the functions were favoured as well as the degree of mixed functions, where a 50:50 ratio between housing and commercial functions (businesses, stores and public activities) was considered to be optimal (By og Havn 2012). The result is shown in figure 5.

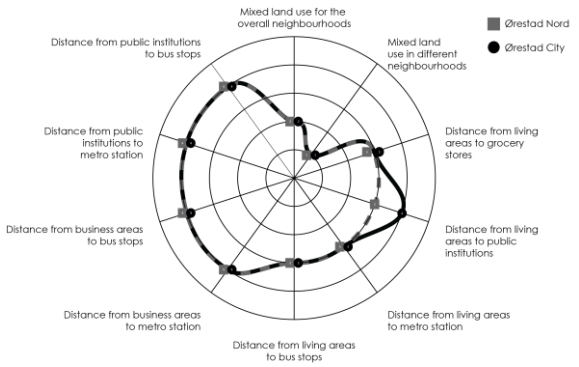

Figure 5. Result of Graded Mixed Land Use Indicators

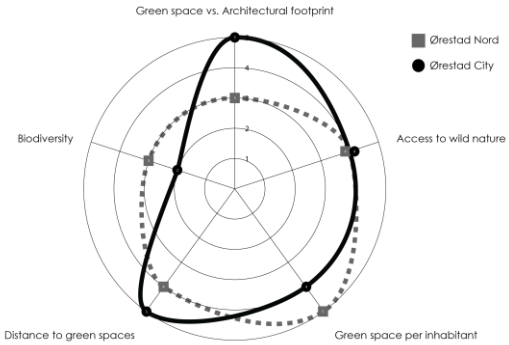

Figure 6. Result of Graded Green Areas Indicators

Green Areas

The presence of green areas is highly related to the perception of a great sustainable urban area. Green areas allows for pleasure, play, and relaxation. A study on green spaces, urbanity and health showed that the presence of green public spaces enriched the overall health of the citizens in larger cities (Maas *et al.* 2006). The study showed that the lower socioeconomic classes benefitted more from these areas than others.

Green spaces influence businesses, economy and are important for their employees' happiness and productivity (CABE Space 2003). Furthermore residential prices increase if a park or other green public space is located nearby (CABE Space 2003).

Based on these findings, it is evaluated that it is important to consider the amount of green spaces compared to the total area and per capita living in the area when evaluating the green areas of a city. This is important because it gives an indication of how green the area is and how populated it is. Furthermore the distances, especially from residential areas, should be analysed, since the distance is crucial for the use of the green space.

The size of green areas should also be considered, as it is related to the daily use; a small area may feel more suited for relaxation and sedentary activities where a large open space invites play, sports and physical activities.

Based on these considerations, indicators have been developed and include the distance from housing and green areas, green areas per inhabitant, access to wild nature, biodiversity and green space vs. architectural footprint.

In general the indicators are evaluated against the 5 point grading scales that favour large amounts of green, large green areas, short distance to them from housings, a large biodiversity and a short distance to wild nature. Figure 6 shows the result of the indicators.

Public Spaces

Public spaces in the cities are the centre for all kinds of activities, physical as well as social. They provide the basic needs which can not be fulfilled in the private homes; socializing with other people, experiencing the nature, outdoor activities, etc., and therefore they contribute to the overall quality of life. The spaces have to be inviting and attractive in order for people to use them. A lot of elements influence the attractiveness of public space and these elements have to co-exist, since over-dominating elements might have a bad influence on the perception of the public space. Jan Gehl has studied public spaces for decades and made general guidelines for what qualifies as a good public space. He has developed a tool for evaluating public spaces, where the public space should fulfill 12 quality criterias (Gehl 2010). The quality criterias is parted in 3 main subjects; protection, comfort and enjoyment/delight. Based on the 12 quality criterias the indicators used to evaluate public space have been generated. This has resulted in indicators describing safety, wind conditions, sun conditions, sitting possibilities.

In each neighbourhood, two public spaces; a green space and a public passage, are selected and evaluated based upon the indicators, described in the next section.

The safety of pedestrians, cyclists and other soft individuals is crucial for a great public space. In order to quantify this protection, measurements and analysis of roads, biking paths, pavements and their location is investigated. Another aspect of feeling safe is the occurrence of crime and the fear of crime – which is likely to occur in dark and deserted places. Precautions to prevent this could be an increased amount of streetlights. Examples show that this can lead to reduced crime rates and fear (CABE Space 2003). This means that indicators concerning safety could be simple measurements of the lightings in a neighbourhood. The lighting levels are measured in lux for the different public spaces in the night in order to compare and evaluate on their effect. Both effect of emitted light and distance between light sources should be taken into consideration.

Climatic effects have a great influence on the use of public spaces. When the wind is blowing it can feel colder to be outside, while sitting in the sun makes you feel warmer. In the design and use of the public space there should be awareness of these climatic effects, and how they will affect and shape the public space. This means that an indicator concerning wind and sun conditions is made. The public spaces are investigated in concern to this and simulations showing the wind conditions (figure 8) are made as well as diagrams showing the conditions for sun/shadow (figure 7).

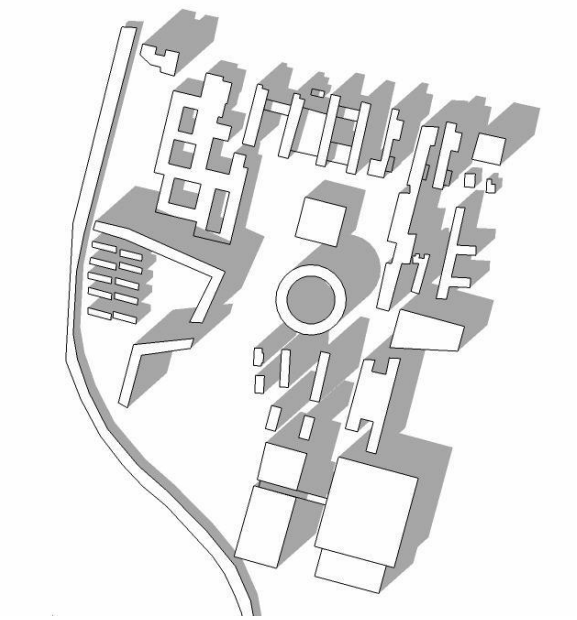

Figure 7. Shadow Analysis of Ørestad Nord

Figure 8. Wind Analysis of Ørestad Nord

Enjoying the weather in the public space, people like to have different possibilities to sit and enjoy the weather. The possibilities are evaluated. Benches are an obvious possibility for sitting down, but in public spaces alternative solutions are often made, where people for example can sit on the edge of a flower bed etcetera and these possibilities are included as well.

Attractions, activities and architecture can all contribute to the public space and the perception of a space. The presence of such has been investigated in order to evaluate the public space.

As mentioned the evaluation of public spaces is being subdivided into two categories (a green space and a public passage) in order to grasp the complexity of this subject. The reason for "zooming in" on these locations is that the perception of public space cannot be generalised from a bird perspective. The feeling one will get in one area of a neighbourhood might be very different from another part of the neighbourhood. The selected green space and public passage in Ørestad Nord and Ørestad City are all evaluated based upon the following specific 10 indicators: street lights, pedestrian safety, bicycle friendliness, wind conditions, sun conditions, possibilities to enjoy the weather (sitting possibilities), sub spaces (smaller spaces in the city), attractions, aesthetic quality and crime rate. The indicators gradings can be seen from figure 9.

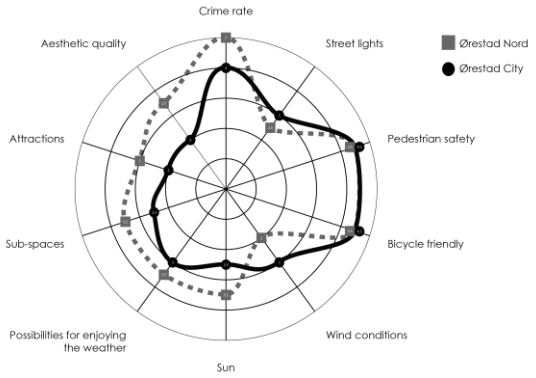

Figure 9 - Result of Graded Public Spaces Indicators

Findings and Discussion

We can see that in terms of the density, Ørestad Nord and City have almost the same indicator results – and are generally graded low from a sustainability perspective. Ørestad Nord was found to perform better in terms of building height and architectural footprint. The building heights is in both areas in general too high when comparing with the thoughts of Gehl (2010), and a high people density (in tall buildings) is prioritized over a high building percentage with a more widespread people density. Furthermore the tall buildings affect sun and wind conditions and the human scale in both areas are lost due to massive building complexes.

In terms of the mixed land use indicators, both Ørestad Nord and City are holding low distances to

public transportation systems making both districts walkable in terms of distances. It is obvious that the metro and city districts have been planned together. A transit oriented development makes public transportation easily accessible. When considering the grade of mixed land use, it is very poor on a local level. Functions are gathered in clusters; education, residential and business are all gathered in individual areas, which make the city less varied in terms of day and night shifts in city life. This could for instance affect the feel of safety during night. The city life is also affected, when playing kids aren't mixed with office people, subdividing the neighbourhood with respect to social and functional classes. It is clear that the required sociological mix of people and functions that Gehl (2010) and Newman (1996) mention have not been met in either neighbourhood. This is consistent with the fact that some of the subgoals for Ørestad were to attract people with a solid economy, and hence lots of bigger apartments were and are offered in Ørestad, making less room for people with a lower income.

When it comes to green areas, Ørestad Nord and Ørestad City are very similar. They are characterized by large open parks surrounded by the massive buildings as one would see it in Central Park, New York. The green areas connect the wild nature of Amager Fælled with the citizens of Ørestad. Especially the green areas in Ørestad City are characterized by its youth, where low vegetation seems odd taken the scale of the park into consideration. Ørestad City is however more sustainable in terms of green spaces since the area is easily accessible and better planned for the locals.

The evaluation of the public space indicators shows that Ørestad Nord is the most sustainable. This can be explained in accordance to the overall development of Ørestad district, where Ørestad Nord was developed a bit ahead of Ørestad City, and hereby the public spaces are more developed as well. Ørestad City differs from Ørestad Nord according to street lighting and wind, which have better conditions in Ørestad City. Ørestad Nord is better in relation to the indicators concerning architecture and possibilities for urban activities in the public space.

Several of the indicators show that the green areas and buildings in the two neighbourhoods of Ørestad are big scale, for which they were designed. The areas are wide, and the surrounding buildings very tall. In 'Byer for mennesker' (Gehl 2010) a social field of vision is mentioned, which reaches a length of 100 meters where movement can be spotted. When decreasing the distance, our other senses are awoken and by the distance of 50-70 meters distance, the sense of hearing is included in addition to the vision sense. At 20-25 meters it is possible to communicate and read expressions and feelings. The senses increase with shorter distances and at 7 meters the sense of smelling works. These distances clearly show at which dimensions the human senses are starting to be stimulated and in which scales cities should be build to invoke interactions like communication and general sensing. And the numbers also show which senses that are in use in Ørestad: mainly the vision sense, sincen the area of the green space in Ørestad City for instance is 170 meters wide and 430 meters in length. This indicates a poor city life and hints that the connection between the green public spaces and the adjacent buildings should be improved in order to improve the city life of Ørestad. Furthermore, the facades are closed off and no direct opening is available in Ørestad Nord and City, which was one of the drawbacks in connection with the aesthetic quality indicator. The façades should rather be inviting and inspiring to walk along.

Ørestad Nord and City are built within the same decade, which causes the buildings to have the same architectural history and expression. The existing community is often the expert of the area and can provide details for historical aspects and what is valuable for the people living there (Project for Public Spaces 2014). But what do you do, when the community is going to be built from scratch? Then there's no architectural history or well-established public spaces to take a starting point from. The history of Ørestad is being written now and perhaps in the future the public spaces and architecture will grow and end up having a story to tell.

The Indicators

The indicators did in general prove useful for evaluating sustainability for Ørestad and gave nuances to the analysis of two quite similar neighbourhoods. However, there are some shortcomings to the method and indicators used for this study. The study seek to evaluate the sustainability of an urban area for which the definitions or ideas of sustainability often are very loosely defined, and where the theory behind only gives vagues numbers or only indications of scales. This means that every indicator has been normalized in order to be able grade and compare properly. In order to grade the indicators each individual indicator has been equipped with a scale. The scales are produced from of our own knowledge, observations and judgement with theories from Jan Gehl and Peter Newman in mind and were limited by the deficiency of precise enough theoretical values. The subjectiveness of this approach adds insecurities to the grading of the indicators. These insecurities could have been minimized by only using existing data as done in the DPL-Copenhagen (Duurzaamheid Prestatie voor een Locatie, 'Sustainability-Profile for Districts') by among other Danish Building Research Institute, which would strengthen the reliability of the

results and increase the trust and belief in the results amoung politicians (Jensen 2009).

This study chose not to limit the amount of indicators to already existing facts, but attempted to generate further indicators in order to grasp the entire sustainability aspect in Ørestad Nord and City. These indicators were treated as soft indicators.

Some challenges were also connected to the production of indicators. It could either be difficulties in setting the grading scales if the outcome of an indicator in theory didn't follow a linear development (for instance the density indicator, where an increase in building density for a neighbourhood after a certain level doesn't necessarily bring any additional benefits for the respective neighbourhood).

For other indicators, it was difficult to set a scale if the indicator in the theory was measured against more than one scale and indicators' use were also very limited without the results from other indicators. This was the case with mixed land use and green areas, where distances were measured. In accordance to Gehl, the perception of distances is highly dependent on how exciting the environments surrounding the walking paths are. But the grading scale for distances was done without this consideration. The same goes for the indicators for green areas where the amount of public green areas should be considered with care. Green areas have been proved beneficial in multiple ways, which would indicate that the more green the better. This is however not always the case, which is also one of the critiques of Ørestad City. The areas are too large and the human scale is lost. Where to draw the line for how large a green area should be hasn't been clarified, since factors such as population, accessibility, park planning, vegetation and many more aspects have a say in this matter.

Other indicators were dismissed by the difficulties to measure them in an objective way. "Biodiversity in green areas" was such an indicator. This indicator was also difficult to measure, since the time for data collection was in the early spring. In countries with variation in climate, and therefore also greenery, during the year the visible impression can vary tremendously. In such cases, the results from some indicators can be affected.

Conclusion

When comparing Ørestad Nord to Ørestad City in terms of sustainability, we see a clear picture formed, but not the anticipated one. Both of the neighbourhoods generally have the same score on the sustainability scales made for the comparison, and hence the overall conclusion must be that there hasn't been a progression towards a greater degree of sustainability in the process of going from Ørestad Nord to Ørestad City. This result reflects and underlines the fact that Ørestad Nord and City both were planned and build in connection to each other, which means that experiences from the earlier phases perhaps hadn't had time to settle before the next building phase was initiated. This can also be seen in the planning visions for the two neighbourhoods. They are more or less the same, where short distances to the metros are prioritised, creating high buildings with a high local people density but surrounded by big green areas.

Even though the indicators didn't show a significant difference in sustainability for Ørestad Nord and Ørestad City, they can still be used to evaluate the overall sustainability of Ørestad as a city district. In regard to this, it was shown that Ørestad in general was sustainable in some aspects of the green areas, but wasn't when it came to density and mixed land use.

This was primarily due to some overall flaws in the urban planning prioritisation, if measured against the sustainability goals of Copenhagen Municipality, Jan Gehl and Peter Newman:

- Prioritising of transport time rather than urban building density
- Prioritising of attractive housing near green areas rather than a dense, lively city scapes
- Prioritising of a uniform population group rather than a more complex one
- Prioritising of peoples need for green over peoples need to look at other people

In general, indicators proved useful for evaluating sustainability of two urban areas in Copenhagen and gave some nuances to the analysis even though the areas were quite similar. The method for grading the indicators, however, could be revised, since the majority of the indicator gradings were done on the basis of subjective assumptions and evaluations due to the lack of precise theoretical values. The creation of indicators was done from a general point of view and could in principle be applied for any city, but some of the indicators could vary with time and place and hence, the forming of urban planning sustainability indicators should always be corrected to apply to the given city - and even more so, since the indicators also should reflect the interests and needs of the city and the stakeholders involved.

References

Azapagic, A. and Perdan, S. (2000) Indicators of sustainable development for industry: A general framework. *Trans IChemE*, 78, pp. 243-261.

Book, K., Eskilsson, L., Khan, J. (2010) Governing the Balance between Sustainability and Competitiveness in Urban Planning: the Case of the Orestad Model. *Environmental Policy and Governance*, 20, pp. 382–396.

By og Havn (2012) *Nordhavnen: From idea to project.* By og Havn.

CABE Space (2003) *The Value of Public Space.* London: CABE Space

Carmona, M. (2010) *Public Places, Urban Spaces: The dimensions of urban design*, Routledge

Gehl Architects (2004) *Places for People - Melbourne 2004*. Copenhagen: Gehl Architects.

Gehl, J. (2010) *Byer for mennesker*. Bogværket.

Hayter, J. A. (2004) Places for People 2004 - Melbourne, Australia. Places – EDRA/Awards 2006, 18 (3), ss. 28-32.

Jensen, J. O. (2009) Sustainability Profile for Urban Districts in Copenhagen. *Sustainable Cities and Regions: Enabling Vision or Empty Talk?*, Örebro University, Sweden

Københavns Kommune (2014) De 14 bæredygtighedshensyn. Københavns Kommune. [Online]. [Accessed 14 March 2014]. Available from Naturstyrelsen: http://naturstyrelsen.dk/media/nst/Attachments/KBHDe14bredygtighedshensynashx.pdf

Maas, J., Verheij, R. A., Groenewegen, P. P., De Vries, S., & Spreeuwenberg, P. (2006) Green space, urbanity, and health: how strong is the relation?. *Journal of epidemiology and community health*, 60(7), 587-592.

Maclaren, V. W. (1996) Urban Sustainability Reporting. *American Planning Association*, 62 (2), pp. 184-202

Minneapolis City Council (2014) [Online]. [Accessed 19 June 2014]. Available from: http://www.ci.minneapolis.mn.us/sustainability/indicators/index.htm

Melbourne Sustainable Society Instutute (2014) [Online]. [Accessed 19 June 2014]. Available from: http://www.sustainable.unimelb.edu.au/content/pages/sustainability-indicators-local-government/

Project for Public Spaces (2014) Eleven Principles for Creating Great Community Places. [Online]. [Accessed 1 April 2014]. Available from Project for Public Spaces: http://www.pps.org/reference/11steps/

Sørensen, C., Lütken, A. Uebel, C., Erikshøj, C. and Landgren, M. (2014) Sustainable Development of Ørestad Nord and Ørestad City