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Applying space syntax in strategic planning of Grimstad town in Norway

A feasibility study

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ABSTRACT

The aim of this short paper is to demonstrate how space syntax and other spatial analyses tools can be applied in setting the spatial framework for planning proposals for the 'Nedre Ekelund' area in Grimstad Municipality in Norway. The area is located within a 10-minute walking distance from Grimstad old town centre. Grimstad is currently experiencing population growth and the municipality aims to densify in a sustainable manner in line with national, regional, and municipal plans and policies.

The application of the various micro- and macro scale spatial analyses is applied for making the diagnosis for the 'Nedre Ekelund' area. As the various spatial analyses show, a well-integrated street network allows for the establishment of shops, land use diversity, and efficient use of land in terms of densification. Moreover, street constitutedness, short topological distances between private and public space, a high density of entrances and windows on building facades, and inter-visibility between building entrances enhance safe and lively streets. These quantifiable values are included as arguments for understanding the development of 'Nedre Ekelund.'. Three scenarios for densification are discussed, and the spatial framework for the scenario with the highest building density is tested out with the space syntax analyses.

KEYWORDS

Urban sprawl, densification, strategic planning, space syntax, micro scale tools

1 INTRODUCTION

Grimstad town at the southern Norwegian coast is constantly growing. The old town centre is oriented towards the sea, whereas new development takes place adjacent to the main highway E18 from Oslo to Stavanger. Like all other Southern Norwegian coastal towns, Grimstad is suffering from that large new car-based shopping malls are establishing themselves at the junction of this highway. Due to preservation challenges of the historic town centre, large chain stores and other central functions have difficulties to establish themselves there due to small sized premises in the old town centre. Therefore, the junction to the highway has up to now been the most attractive spot for new large chain stores.

The old town centre is the only place in the municipality that have mixed functions that enhance street life. The municipality sees great value in preserving this old centre due to its strong place identity. Moreover, the municipality has ambitions to develop the town as a university town and a technology town. There are plans on the table to establish a battery factory in the municipality, in which will contribute to population growth. It will then be important to find suitable areas to densify with purpose to reduce private car dependency and facilitate sustainable development in line with state, regional and municipal plans.

Moreover, Grimstad has a high number of aging inhabitants. This implies a growth of single person households, which in turn indicates that the provision of dwellings must be adapted to this. Currently, most of the dwellings in Grimstad consists of single-family houses. Most of them built after 1970 have contributed to the urban sprawl into the countryside.

The ‘Nedre Ekelund’ area is located within 10 minutes walking distance from the old town centre. It is also located close to the junction to the highway E18 and a car-based shopping centre. This area consists of scattered buildings located on agricultural- and nature areas. The area is also in the vicinity to a range of functions such as a grocery store, a kindergarten, a primary school, sports facilities and areas for outdoor recreation. Therefore, the challenge is to avoid that this area will be developed in such a way that it enhances private car dependency.

2 SPATIAL ANALYSES OF GRIMSTAD

First we conducted analyses of the central areas of Grimstad to make a diagnosis of its spatial performance. We used a wide set of analyses techniques from the urban morphology, place phenomenology and urban network tradition (van Nes and Yamu 2021, p. 29). Figure 1 shows various space syntax analyses of Grimstad. On a local scale, the streets in the historic centre have very high integration values. On a global scale, the main route between the historic town centre and the car-based shopping centre at the highway E18 is highlighted. The Nedre Ekelund area is located adjacent to the car-based shopping centre. Therefor there is a big challenge to enhance new dwelling areas that are not dependent on owning a car.

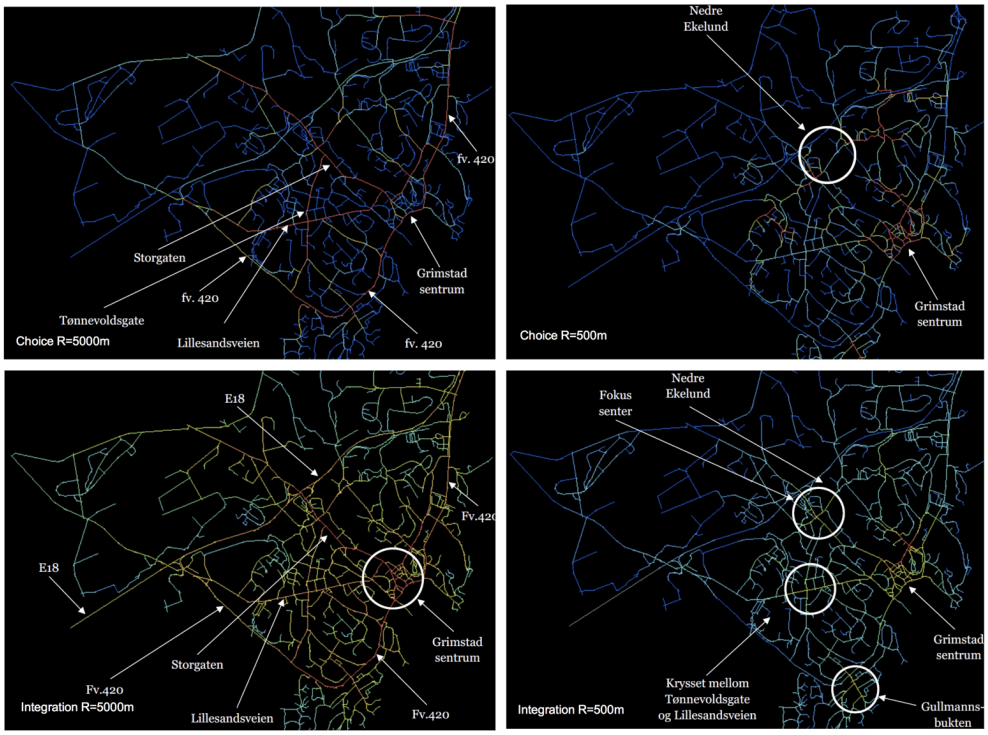

Figure 1: Space syntax analyses of Grimstad's street and road network

Figure 2 shows analyses of street profiles (Eldijk et.al 2014), spacematrix (Rådberg 1996), MXI (van der Hoek 2009), Kevin Lync's image of the city (Lynch 1960), topological depth between private and public space (van Nes and López 2010), and density of entrances of Grimstad. Most of Grimstad's street-profiles are vehicle dominated, except from the town centre and in areas in the vicinity of the car-based shopping centre. There are also pedestrian only paths from Nedre Ekelund area towards the old town centre.

The spacematrix analysis shows that the city has a large proportion of typical single-family houses (low rise point). If the municipality keeps on facilitating future population growth with these types of houses, it will further contribute to car-based low density urban sprawl into the countryside. The population growth potential for the municipality is large, in which requires efforts to change the current trend. The MXI analyses show that the old town centre is multi-functional, whereas the rest of the town has mono-functional areas.

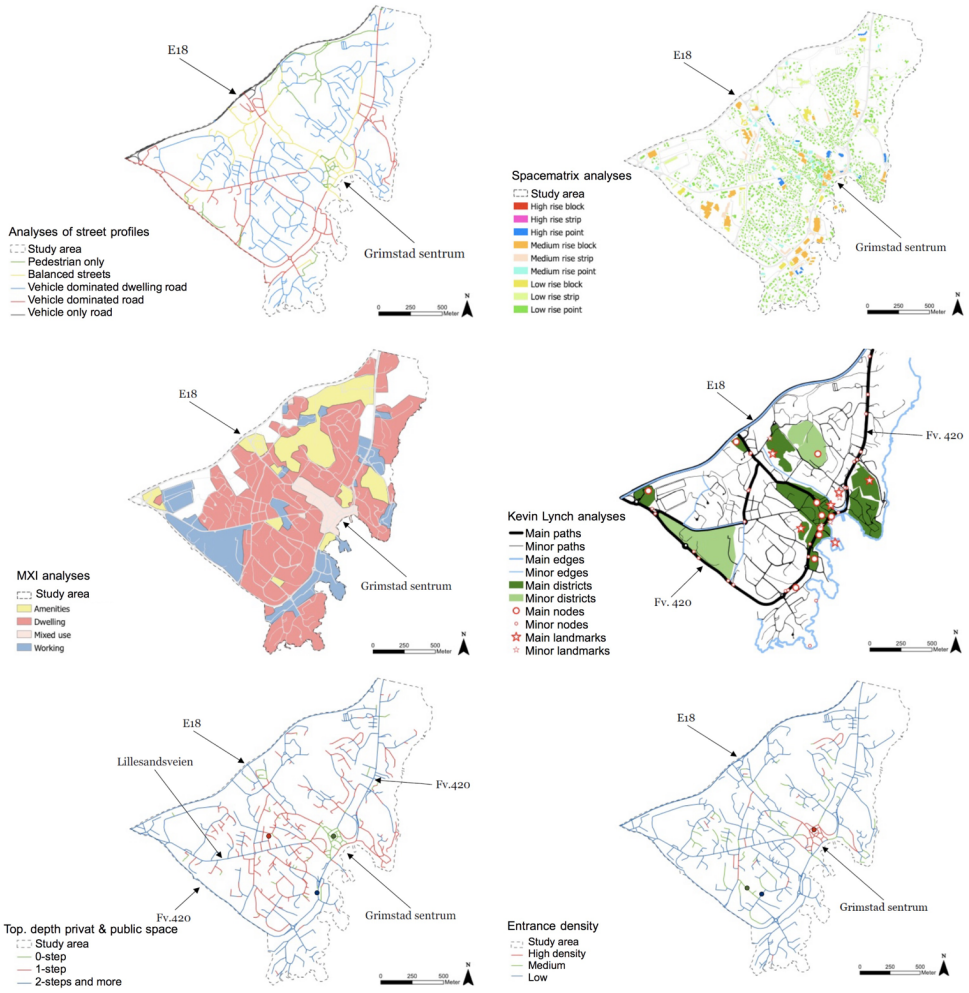

Figure 2: Various spatial, morphological, and place phenomenological analyses of Grimstad

In order to reveal the image of the various areas, the Kevin Lynch analysis shows that the old town centre has several important landmarks and has clear districts with a strong place identity. The remaining areas are rather poor. The analyses of the building-street interfaces shows that buildings are directly connected to streets in the old town centre. Likewise, the density of entrances with windows are high in the town centre, where it is poor in the rest of the area.

3 CONDITIONS FOR NEW DEVELOPMENT

To ensure that Nedre Ekelunden is developed into an attractive, vital and safe area, it is not enough that the street network is well integrated, the functional mix needs to be high and the building density high as well. The relationship between building and streets needs also to be considered. As research has shown, there are correlations between crime risks and the degree of spatial integration of the street network, degree of street constitutedness, degree of topological depth between private and public space, and degree of intervisibility of entrances with windows (van Nes and López 2010, 2013, Miranda and van Nes 2020). To ensure street safety in new development for Nedre Ekelund, it is

therefore important that the buildings have active frontages facing towards the streets, have a high density of entrances and windows on ground floor level, and that the entrances have low topological depth. These microscale analyses are also supported by the social aspect of cities emphasized by Jacobs (1960), Gehl (1971), Carmona et.al (2010) and Montgomery (1998).

The underlying factor for enhancing a sustainable transformation of urban areas is the spatial structure of the street and road network (van Nes 2021). As stated, Hillier et al. (1993) and Penn et al (1998) research shows that Space Syntax can predict how the spatial structure of the street network can affect the flow of traffic and the location of shops (van New and Yamu 2020). This is named the theory of 'the natural movement economic process', explaining that a continuous flow of people attracts shops and other industries and that shops also tends to attract people. But these processes are steered by the degree of spatial integration of the street network. Therefore, the aim is to propose a locally integrated street network, well connected to the highly integrated main route network with purpose to enhance short walking distances in the new plans of Nedre Ekelund. The aim is to enhance a street network with high potential for through traffic for pedestrians and an integrated street network with a possibility of shaping a pedestrian-based local centre.

As research has shown, a natural urban transformation process is dependent on an integrated street network for supporting high building density and high degree of functional mix (van Nes et.a. 2012, Ye and van Nes, 2014). Moreover, when the streets are constituted and visible from entrances and windows from adjacent building, it enhances safe and lively urban pedestrian friendly areas (van Nes 2021). Therefore, Nedre Ekelund's street network need to have high local integration with purpose to support high building density and high degree of land use mixture. High local integration om the street network support densification in a sustainable manner (de Koning et al 2020a) and reduce energy use for transport (de Koning et al 2020b). Our proposal is to enhance high building density with the main emphasis on medium rise block and high degree of functional mix. This need to be supported by a locally integrated street network of the plan proposal for transforming this segregated area to an integrated, attractive, safe and lively area.

4 SOLUTIONS FOR NEDRE EKELUND

To ensure sustainable urban development, the various planning authorities recommends a densification strategy within the municipal centre located at the southern side of the highway E18. The current densification strategy of Grimstad municipality is that 80% of all future growth will take place within a delimited area to avoid urban sprawl and to facilitate sustainable compact urban development. Proposing urban densification at the Nedre Ekelund area is thus in line with these regional and national policies.

We made 3 scenarios on how Nedre Ekelund could develop. Figure 3 (top) shows the plans of all three scenarios). Scenario 1 is to go on as now, which is not sustainable. Here we tested out how many single-family houses we can get into the area. Scenario 2 is to propose row houses in the

area, whereas scenario 3 propose urban blocks with three floors. Scenario 3 is the most sustainable one, so therefore we suggest this one. Below in figure 3 we show a comparison of the local angular choice analyses of scenario 3 with the current situation and the new proposal. The street network configuration settles the framework of the plan proposal. Space syntax analyses of scenario 1 and 2 did not increase the spatial integration on a local scale at all.

Our plan proposal is to make a completely new spatial structure and establishment of a new modern district in Grimstad. The buildings will contain homes, shops, offices and leisure facilities, and will offer dwellings for singles, young people, the elderly and others who want to live in the immediate vicinity of all daily functions. The adjacent car-based shopping centre needs also to be taken into consideration. It must be well-connected for pedestrians to its surroundings, and towards the old town centre. This with purpose to reduce decline in the old town centre. By arranging for several attractive functions to be established at Nedre Ekelund, it will probably generate several people outside the plan delimitation as well.

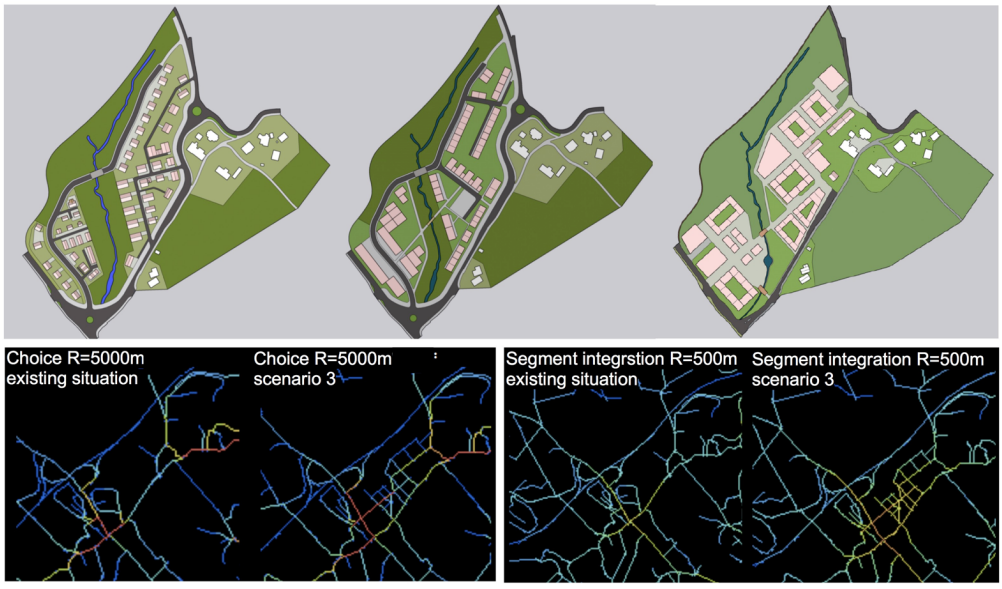

Figure 3: Three development scenarios for Nedre Ekelund (top) and angular choice analyses of scenario 3 (below)

In order to ensure a sustainable urban transformation at Nedre Ekelund, it is important to have good analyses tools for making impact assessments of various planning proposals. The aim is to develop an area where a large part of the future population in Grimstad can live with a modern car-free street plan, squares, parks, mixed functions and homes within short walking distance of the old town centre and existing bus stops.

5 CONCLUSIONS

The development of scenario 3 at Nedre Ekelund will provide a significant provision of new dwellings within short walking distance to the old town centre. The proposed dwelling types is apartments for accommodating the growing population of elderly and single-persons household. Moreover, the aim is that the proposed new street structure and the street profiles shall enhance walkability and cycling. The proposed high degree of land use diversity combined with access to squares and surrounded recreation areas will enhance that various types of people can use this area.

The theories of the natural movement economic process and the natural urban transformation process together shows that an integrated street network on local level with good access to integrated main routes facilitates high number of pedestrian movements, the establishment of high land use diversity and high but balanced building density. Simultaneously, the streets need to be constituted, inter-visible with a high density of entrances with windows directly connected to the streets on ground floor level from adjacent buildings. All these spatial aspects set the physical framework for transforming Nedre Ekelund to an attractive, vital and safe neighbourhood in the future.

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