Spatial Improvement Strategies for Deprived Neighbourhoods

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SUMMARY

Since 2007 strategies are made for improving the worst 40 deprived neighbourhoods in the Netherlands. However, a spatial diagnosis tool is missing. Therefore, space syntax analyses were carried out of all 40 neighbourhoods in 2012. Various micro and macro scale tools were applied. The Space Syntax method was used to analyse the macro scale relationships in the neighbourhoods, whereas the micro scale tools is developed by the author in an earlier research project on space and crime.

As it turns out from the analyses, the deprived neighbourhoods can be classified in four groups, based on their spatial properties. These groups do not only provide a good classification of the different spatial properties of the neighbourhoods but also show that spatial properties, social composition of dwellers and building style are inter-correlated.

This contribution aims to bring these research results further into the urban renewal and planning discussion. The challenge is to find a way to communicate the research results to various practitioners dealing with or intervening in the built environment. The findings on the relationship between urban space and urban safety need to be made understandable and applicable for everyone. The outcome is a design and strategic planning checklist on how to plan and design a safe and vital urban area based on research results.

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1. INTRODUCTION

In 2007 Dutch minister Ella Vogelaar from the Ministry of Housing, Communities and Integration appointed 40 neighbourhoods in the Netherlands on a priority list for revitalisation. These neighbourhoods were labelled 'priority neighbourhood': area's in which various problems in relation to unemployment, liveability and safety accumulate in combination with an ageing and one-sided housing stock (Priemus 2005).

Since then, the national and local governments and local partners have developed various action plans and policies. Local residents were included in these plans. The most common measures were replacement of rented homes by owner- occupier dwellings, selling off social housing, improving the public spaces, creating broad-based schools or multifunctional neighbourhood centres, involving residents in the management of the neighbourhood, and providing help and support to households with problems (VROM/WWI 2010). These interventions had a total cost of 750 million euro, but the overall effects were very disappointing (Permentier et all 2013). Restructuring was the only intervention for which significant positive effects were found, especially large-scale restructuring. All other interventions produced no significant positive outcomes.

The results of the evaluation suggest that spatial measures are probably a more effective way to deal with neighbourhood problems related to unemployment, safety and liveability than social or (other) physical interventions. The question is what are the relationship between safety and spatial layout? How to use this knowledge in urban restructuring practice? What kinds of spatial improvements are needed for different types of neighbourhoods? How to transform knowledge from research into practice? How to make an operational checklist understandable for practitioners for enhancing safe, vital and liveable neighbourhoods?

2. RESEARCH ON SPACE AND URBAN SAFETY AND VITALITY SO FAR

Before the millennium, research on space and urban safety was steered by two contradictory views. On the one hand, the Jane Jacobs view is to promote open and permeable build environments. The stranger is perceived as a source of safety and is a part of the natural police mechanism. On the other hand, the Oscar Newman view consist in promoting the "defensible space" principles with close and impermeable built environments. Here the stranger is perceived as a source of danger (Hillier and Shu 2002). Some research results supported the Jacobs view and others the Newman view. As it turned out, it is dependent on how statistic can be used or mis-used (van Nes and López 2010).

Since the 1980's the space syntax method, a method for quantifying spatial relationships in built environments, has undergone large improvements. For analysing built environments space syntax consist of four things. Firstly, it gives a *concise definition* of urban space.

Secondly, Space syntax is a family of techniques for *analysing* built environments as the networks of space formed by the placing, grouping and orientation of buildings. These spatial relational patterns can be weighted by three different definitions of distance. The *metric* distance measures a town's street and road network as a system of shortest paths, while the *topological* distance calculate a town's street and road network as a system of fewest turns paths. Finally, the *geometrical* distance calculates a town's street and road network as a system of least angle change paths. Each type of relation can be calculated at different radii from each street segment, defining radius again either in terms of shortest, fewest turns or least angle paths (Hillier and Iida, 2005). Together these spatial measurements can show the degree of spatial inequalities on various scale levels.

Thirdly, space syntax is a set of techniques for *observing* how these networks of space relate to functional patterns such as dispersal of functions, area differentiation, and the location of various identified artefacts. Fourthly, based on the empirical results, space syntax is a set of *theories* about how urban space networks relate in general to the social, economic and cognitive factors which shape them and are affected by them. The *Theory of the natural movement economic process* states that the spatial configuration of the built environment influences the movement pattern from everywhere to everywhere else and the location pattern of economic related activities (Hillier et al 1993). The techniques have been applied to a large number of cities in different parts of the world. In this way a substantial database now exists of cities, which have been studied at some level using space syntax (Hillier et al 2007).

The first researcher to apply the space syntax method on crime data was Valerie Alford. As her research results show, different types of crime require different type of space (Alford 1996). In 2000, Simon Shu investigated in detail burglaries and car-thefts in 3 neighbourhoods in the UK. As his research results show, burglaries and car-thefts takes place in segregated streets. As Shu concludes, the social composition of dwellers can overrun the spatial parameters (Shu 2000). In 2005, a research was carried out on the relation between burglars' home addresses and spatial layout on where they operate. As it turns out, burglars choose to operate in the spatially most segregated streets in a radius of 3 km in their own neighbourhood. In addition, they prefer streets that have entrances located on only one side of the street (van Nes 2005).

Since the use of statistics appropriately is an issue, Hillier and Sahbaz applied the band risk method in a research project on space and crime in the UK. Their conclusions show clearly that there is a correlation between space and crime (Hillier and Sahbaz 2005). Van Nes and López applied the band risk method one year later. Burglary and car-theft data was collected over a two years period in two Dutch cities and correlated with the space syntax analyses. In addition, a spatial analyses tool was developed to be able to quantify the relationship between private and public space. This micro scale tool measures how buildings are connected to public streets. As the results of this inquiry show, burglaries take place in spatially segregated streets, where buildings are turned away from streets and where there is a lack of inter-visibility between buildings (van Nes and López 2010). As all these research projects show, burglars do not understand defensible space. Jacobs' qualitative observations make sense.

Jacobs stresses that the presence of people in streets make a city lively and safe. According to

Hillier and Shu (2002) high spatial integration and high connectivity on various scale levels of the street and road network contribute to high presence of people in streets. In line with the theory of the natural movement economic process, enhancing well-connected and highly integrated streets might be one way to design a built environment out of crime (Hillier and Shu 2005).

In 2012 the time was ready for the application phase. However, there is a challenge to communicate with practitioners. Therefore, an inter-disciplinary team was set up with one criminologist, an urban design office and one space syntax specialist. All cities with one or more neighbourhoods on the Vogelaar list were analysed both with the help of statistical analyses (SPSS) and the Space Syntax method (van Nes & López 2013). This makes it possible to reveal the spatial configuration of the street network in a neighbourhood and to correlate spatial characteristics with data on social composition and criminal dispersal. In addition, 8 reference neighbourhoods were added. These reference neighbourhoods have the same social profile as the neighbourhoods on Vogelaar's list.

The following macro spatial values (from the space syntax method) were used in the comparison of the 43 neighbourhoods:

- Global integration – shows how spatially integrated the neighbourhood's street network is in relationship to the whole city/town.

- Local angular integration with topological radius 3 – shows how spatially integrated the neighbourhood's street network is in relationship to its surroundings.

- Angular analyses with a high metrical radius – shows how the neighbourhood's street network is connected to the location of the main routes in the city/town.

- Angular analyses with a low metrical radius – shows the spatial potentials for the vitality of a local centre inside the neighbourhood.

- Correlation metric high-low – shows the degree of correlation between the angular analyses with a metric high and low radius. The higher the correlation, the more spatial potentials for local small businesses and street life.

- Main routes in relation to the local streets – shows the degree of adjacency and connectivity between main routes and local streets. If there are too many direction changes from the main routes, the area scores low. If the local streets are directly connected to the main routes, the area scores high.

- The angular step depth taken from the main routes – This variable is similar to 'main routes vs local', but also takes the angular weighting between the street segments into account. If the number of direction changes to all streets from the main routes is low, the area scores high. The area scores low if the average step depth taken from the main routes is high.

- Micro scale spatial relationships between private and public space influence the extent

in which individual life styles can interfere with street life and visa versa. The various degrees of interfaces or spatial inter-connections between these two kinds of spaces influence human behaviour in cities (van Nes and López 2010). The following micro scale variables were used in the analyses and comparison of the 43 neighbourhoods:

- Inter-visibility between entrances and windows and streets – shows how inter-visible the streets are. A street is considered inter-visible only when the entrances with windows are connected directly to the street, when there is a dwelling, office, cafe or shopping function on the ground floor level, and when these two aspects are located on both sides of the street. If the dwellings are located a half floor higher than the street, the street is not considered inter-visible.

- Inter-visibility main routes – shows how much of the main routes inside the area are inter-visible from the ground floor of adjacent buildings.

- Correlation between visibility and degree of spatial integration. If the area has inter-visible streets, but located only in the segregated streets and the main routes are not inter-visible, the area scores low. If the area has inter-visible main routes, but poorly inter-visible segregated residential streets, the area scores medium. If the area has inter-visible streets and a high degree of spatial integration, the area scores high.

Social, economic and demographic data was obtained from the Central Bureau of Statistics. These data included: total population, number of private households, number of dwellings, percentage of inhabitants of 15-25 year, percentage of households without children, percentage of households with children, average household size, percentage of non-western households, property-stock value, percentage of rental homes, number of private cars, average income per recipient, average income per household, percentage of persons with low income, percentage of households with low income and economic non-actives.

Data on total numbers of recorded crime was obtained from the AH Misdaadmeter (a register of crime and anti-social behaviour data) and included the total numbers of recorded incidents of theft from/out of cars, violence and vandalism. Each of these crime numbers were related to 10.000 residents.

3. THE RESULTS

As the result show, the spatial and social classifications are related to each other as well as to crime data. The more spatially segregated the local streets are, the higher occurrence of crime and anti-social behaviour. The same accounts for buildings that are turned away from streets with a complex entrance situation. The social composition of dwellers contributed to even worsen the occurrence of crime and anti-social behaviour (van Nes and López 2013). The next challenge is to propose improvement strategies based on the research results. For this reason, the 43 neighbourhoods were classified into four groups based on the distinction between the macro and micro scale spatial parameters:

Group 1. High values on the macro as well as the micro scale levels.

Group 2. High values on the macro level, low values on the micro level.

Group 3. Low values on the macro level, high values on the micro level.

Group 4. Low values on the macro as well as the micro scale levels.

The results from the spatial analyses show that the four groups of neighbourhoods are clearly distinctive from one another. This classification is useful for identifying what kinds of improvement strategies are needed for which type of neighbourhood.

Neighbourhoods belonging to group one tend to be areas with high gentrification potentials. These areas are located adjacent to town and city centres. Problems in these neighbourhoods are often related to the low technical quality of the buildings. The neighbourhoods tend to have many apartments that are too small and lack a sufficient number of luxury dwellings. Some of the neighbourhoods belonging to this group show signs of gentrification processes. Students and the creative class are moving into these areas, and some of the historic buildings are restored and reused. Examples on these kinds of neighbourhoods are Amsterdam-Oost in Amsterdam and Transvaal in The Hague. These kinds of neighbourhoods tend to have buildings with a strong place identity, but they need technical improvements. The spatial drivers for a gentrification process are present in these neighbourhoods. They have a highly integrated street network and a high degree of inter-visibility between buildings and streets.

Neighbourhoods belonging to the second group also have large potentials for gentrification. The main routes are located inside the neighbourhood and well connected to most local streets. The most notable difference with group one is that neighbourhoods belonging in the second group have several streets with blind walls or buildings with entrances turned away from the streets. Examples are Nieuw West in Amsterdam, and Malburgen, Persikhaaf and Het Broek in Arnhem. In this group, there are also some neighbourhoods with well-integrated and inter-visible main routes through the area, but the inter-visibility between buildings and streets is poor in the side streets. Examples of these kinds of neighbourhoods are Maastricht Noord-oost, Kruiskamp in Amersfoort, Bos en Lommer in Amsterdam, Schilderswijk and Stationwijk in The Hague, and Feyenoord, Vreewijk, Oude Noorden, Crooswijk, Bergpolder and Charlois in Rotterdam.

Neighbourhoods belonging to group three consist of low-rise buildings with small gardens and a segregated street network. The streets are inter-visible with entrances connected directly to the streets. Several of these neighbourhoods lack, however, an integrated main street or main route or a connection to a main route on their edges. Examples of these neighbourhoods are Klarendal in Arnhem, Rivierenwijk in Deventer, Meezenbroek in Heerlen, and Woensel West, Bennekel and Doornakker in Eindhoven. Some areas have gentrification potentials due to adjacency to an integrated street net. Examples of these kinds of neighbourhoods are Velve-Lindenhof in Enschede, Nieuw West in Rotterdam, Hoog and Korrel in Groningen, and Ondiep and Zuilen Oost in Utrecht. The challenge in these neighbourhoods is to make new connections in the street network that will increase the low spatial integration.

The neighbourhoods belonging to the last group tend to be located on the edge of a town or city. Most of them consist of high rise buildings or flats with poor connections between

private and public space. Others consist of low-rise buildings, positioned in such a way that there is no inter-visibility between the buildings' entrances. Some areas have a mix of both cases. What they all have in common is a poorly integrated street and road network and poor inter-visibility between buildings and streets. Examples of neighbourhoods of this kind are Overdie in Alkmaar, Buitenhof in Delft, Meezenbroek in Heerlen, Hechterp Schie in Leeuwarden, Hatert in Nijmegen, Steenvorde Zuid in Rijswijk, Nieuwland in Schiedam, Poelenburg in Zaanstad, Zuid Oost and Amsterdam Noord in Amsterdam, Wielwijk and Crabbenhof in Dordrecht, Kanaleneiland and Overvecht in Utrecht, Overschie and Zuidelijke Tuinsteden in Rotterdam and the area's Bouwlust, Vredesrust, Morgenstond and Moerwijk in The Hague. More than half of the 43 neighbourhoods belong to group four.

4. SPATIAL PRINCIPLES FOR IMPROVEMENT

From the analyses of the 43 neighbourhoods, and results from previous research on space and crime, some general improvement strategies can be proposed. The challenge is to make an understandable language for communicating the results to practitioners from various disciplines. Likewise, some simple diagrams on how things are inter-related to one another are needed. The aim is to have an answer on the question "how to regenerate or to plan/construct a safe and vital neighbourhood?"

These proposed 9 principles for designing safe built environments must be understandable for the road engineers, the criminologists, the urban planner, the land use planner, the architect, the decision makers as well as the project developer.

On a macro scale, the first principle is that main routes should go *through* instead of *around* a neighbourhood (figure 1). This contributes to that visitors travel through the neighbourhood contributing to potential customers to the neighbourhood's micro scale businesses. Likewise, the flow of visitors contributes to the natural policing mechanism for the neighbourhood due to the presence of various types of people in streets throughout the day. This principle contradicts with the current road engineers' guidelines and current road planning practice. Social vitality and safety is often sacrificed on the cost of traffic safety.

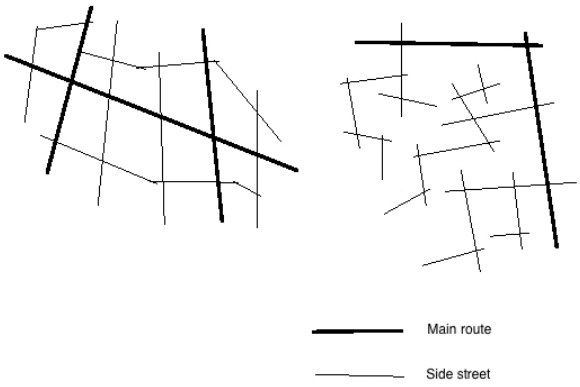

Figure 1: Make sure that the main routes goes *through* the neighbourhood (left) than around (right) the neighbourhood

The second principle is to enhance that buildings have doors and windows connected directly to streets on their ground floor level (figure 2). This contributes to "eyes on the streets" as a part of the natural policing mechanism. Streets with lack of entrances are often perceived as being un-safe, empty and have a lack of social control.

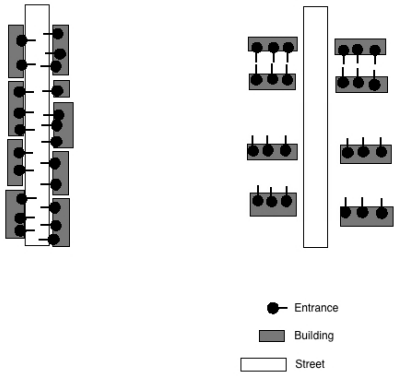

Figure 2: Make sure that entrances and windows are connected directly to the street (left) than turning away from streets (right)

The third principle is to enhance that all streets have buildings that faces towards the streets (figure 3). Conversely, blind walls contribute to that groups of youngster tend to gather together and there is a lack of social control between buildings and streets. In the registered crime data, often illegal use of fireworks takes place along these kinds of streets with blind walls. Here there is a challenge to steer project developer to orient buildings towards all streets.

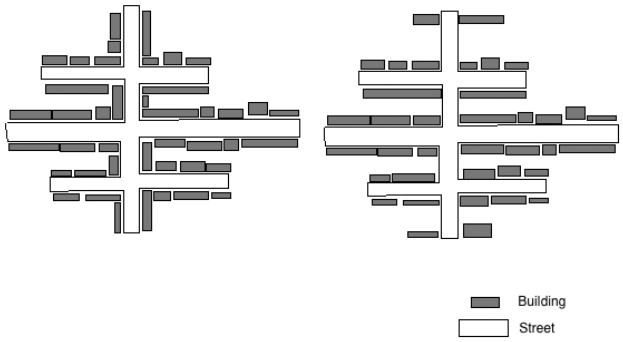

Figure 3: Avoid blind walls, particular along main streets (left) than the opposite (right)

The forth principle is to enhance an active function, such as dwelling, office or shop, on the ground floor level (figure 4). This contributes to a continuity of activities inside the building,

which involve a presence of people that can keep an eye on the street. Storage rooms and parking garages contributes to empty and dead streets.

Figure 4: Enhance an active function, such as dwellings, shops, or offices in the ground floor of buildings (left) than a passive function, such as storage rooms or garages (right). Source: Google street view.

The fifth principle is to enhance a "network" structure on the local street network than a "tree" structure (Figure 5). A network structure creates high degree of inter-accessibility in which contributes to high presence of people in streets. When a main route is located in the middle, it creates high degree of inter-accessibility between locals and through travellers. Often these types of main routes tend to have a large variation in different types of micro businesses and shops. A local street network with a "tree" structure contributes to complex travel routes between local streets and to few people in streets. A main route located on the edge of a neighbourhood with a tree structure contributes to a low variation in the micro scale businesses. Often the few enterprises located along these kinds of main routes tend to be car-based.

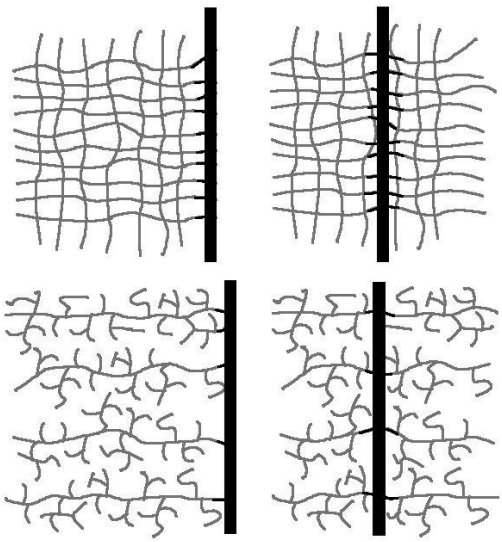

Figure 5: Enhance a network structure (top) than a tree-structure (bottom) on the local street network.

It is not enough to let the main routes run through the neighbourhood, but they must also be connected to local existing centres. The sixth principle is to let the main routes go through or to tangent existing local centres (figure 6). These local vital centres often have a well-connected dense local street network and have a large variation of shops and micro scale businesses. Pre-War neighbourhoods tend to have this kind of spatial structure on their street network. When the main routes goes around local centres, often the shopping facilities tend to be very limited. Either a local super marked with the necessary supplies or no shops at all are located in the middle of such a neighbourhood. Often post-war functionalist neighbourhood have these spatial features.

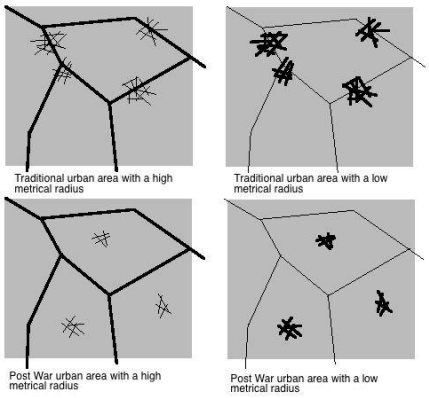

Figure 6: Make sure that the main routes goes *through* existing local centres (top) than *around* them (bottom).

The seventh principle is to make sure that entrances constitute the streets. The best is that entrances are located on both sides of streets for enhancing high degree of inter-visibility for reducing burglary risk (van Nes and López 2010). In the cases where inter-visibility is impossible, make at least sure that the streets are constituted. Un-constituted streets contribute to empty streets with high degree of anti-social behaviour and feeling of un-safety (Rueb and van Nes 2009). The same accounts for main routes. When a main route is constituted by entrances and windows on buildings' ground floor, it generates lively local centres often frequented by a high amount of people. When a main route is un-constituted, the street life is dominated by vehicle transport.

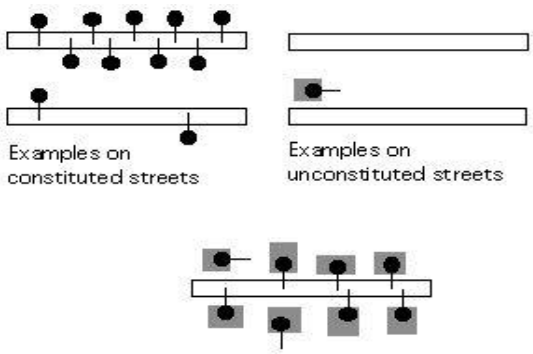

Figure 7: If it is not possible to make inter-visible streets make them at least constituted (left) rather than un-constituted (right)

The eight principle is to enhance a direct connection between private and public space (figure 8). This contributes to a high degree of social control and natural policing mechanism between dwellers and human activities in streets. A high number of semi-public or semi-private spaces between a dwelling and a public street contribute to empty streets.

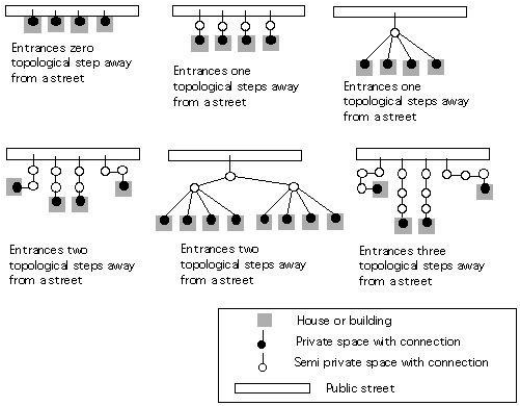

Figure 8: Make sure that the topological depth between private and public space is short (top) than long (bottom). Avoid large semi-private and semi-public spaces.

The ninth principle is to enhance that the main routes are connected to all local streets for generating pedestrian based shopping streets with a large variation of shops and micro scale businesses (figure 9). When a main route has few connections to the local street network, car based shopping centres tend to locate at these points.

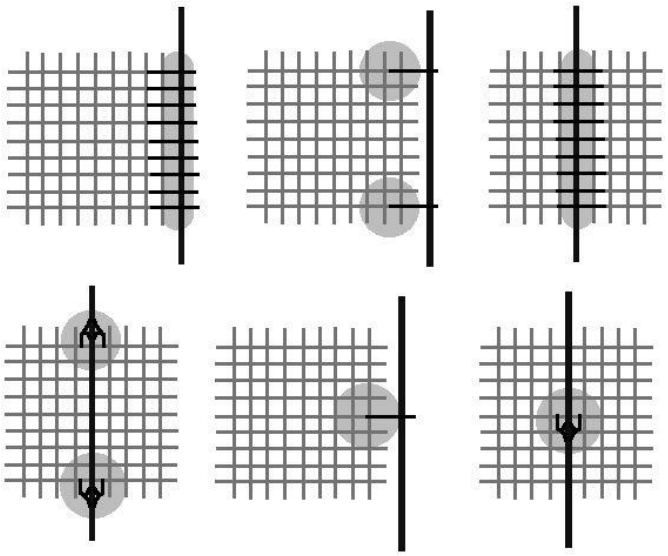

Figure 9: Make sure that the main route is connected to all local streets for enhancing a large mixture of functions.

5. CHALLENGES FOR URBAN RENEWAL PRACTICES

Although limited in its methodological setup, this contribution can at least give some suggestions on how to improve the spatial setup from neighbourhoods making them safer, livelier and economically vibrant. Not all neighbourhoods on the priority list have high crime rates. When distinguishing the neighbourhoods with relatively high and neighbourhoods with relatively low crime rates, high crime rate areas generally have their main routes outside the neighbourhood while safer areas more often have main routes running through its local centres. A well-integrated and well-connected main route going through local centres encourages the natural development of a local lively centre inside the neighbourhood. The main route system functions as an armature for the whole neighbourhood and generates the degree of natural mixture of visitors and people living inside the neighbourhood. Such a main route encourages the establishment of micro businesses inside the neighbourhood hence shaping job opportunities for the inhabitants. Previous research has shown that neighbourhoods with main routes through its centres are generally safer especially when most local residential streets can be reached within 1-2 direction changes from the main route network (van Nes and López 2010).

On a micro scale level, the positions of buildings and entrances along a main route or a residential street contribute to the degree of social control and eyes on the street. The more buildings located along a street, combined with entrances directly connected to streets, the higher the potentials for natural social control. When entrances and buildings are turned away from a well-connected street, opportunities are created for youngsters to group together and commit incivilities outside the natural control of adults (Rueb and van Nes 2009).

The social composition of the dwellers, their lifestyles and wishes are also important factors in choosing the priority of improvements. Spatial parameters play a role in the socio-economic performance of a neighbourhood. It is all about how the spatial layout contributes to generate a reduction of criminal opportunities, shape a natural social control mechanism between inhabitants and visitors, and shape opportunities for meeting and the location of micro scale businesses inside the area.

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