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The perceived safety and spatial behaviour in three different neighbourhoods in Rotterdam

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Abstract

There is a difference between registered safety and perceived safety. An inquiry was done to register how people use space in three different neighbourhoods from different time periods during a weekday. The following spatial parameters were taken into account: Axial and angular analyses with topological and metrical radiuses of the street and road network (Hillier & Ida 2005), and various micro scale tools (van Nes & López 2010) showing the relationship between private and public space. In one of the area interviews were made of the areas users and dwellers for identifying which streets and public spaces are perceived to be unsafe and safe.

As it turned out, high spatial integration of the street net contribute to a great variation of all types of people in streets. These areas consist of a highly inter-connected street net with shops located along it and with entrances directly connected to the street. These areas are conceived to be the safest to stay and move through by the interviewed users. Conversely, neighbourhoods with a labyrinthine street structure and lack of entrances and windows on the ground floor level contribute to few people in street and to a feeling of un-safety in the spaces between buildings. The degrees of spatial integration on various scale levels are low in these kinds of housing areas.

Therefore, the structure of the street network and the public-private relationship between buildings and streets plays a role for setting the physical framework to encourage street life and perceived safety.

Keywords

Social segregation, spatial segregation, safety, problem neighbourhoods

1. Introduction

From the early nineties the concept “problem neighbourhood” (probleemwijk) appeared regularly in Dutch newspapers. The image of these neighbourhoods is described in the media as dereliction, social segregation and to have a high amount of crime and drug-related problems. Therefore these neighbourhoods were brought on the political agenda due to their visible physical and social-economical problems.

In 2006 140 neighbourhoods was listed as urgent for regeneration. In 2007 it was reduced to 40 neighbourhoods. Compared to the national average, the inhabitants’ in these neighbourhoods

incomes are low, the unemployment rates are high, there are high numbers of non-western poor skilled immigrants living inside these neighbourhoods, the build mass consists of several poor quality houses, and the inhabitants experience social and physical inconveniences. People with a middle-income are leaving these areas. As a result the neighbourhoods lose their facilities and services and contact with the Dutch society as a whole (Vogelaar, 2007). 50% of these neighbourhoods are built in the post-War reconstruction period.

In 2007 the Dutch government set up an action plan to improve these 40 neighbourhoods. The actions consist in improving the housing qualities, facilitate working opportunities, offering education and playing facilities for children and youngsters, and to enhance social integration and safety. In the plan for safety the motto is 'safety starts with prevention'. Therefore a local policeman was appointed to spot and tackle problems in each neighbourhood. Moreover, policies were made to offer enough affordable housing of good quality. According to the action plan, the idea was that the diminishing of the social problems in a neighbourhood is a combination of social and physical policy (VROM, 2007).

Three years later the status of this action plan is analysed by the government (Rijksoverheid, 2010). The regeneration actions consisted mostly in physical improvements of buildings, make some new parks and to replace some buildings with new ones aimed for a middle-income class. Often these physical changes are done without any knowledge on how the relationship is between the spatial layout and human behaviour in terms of street life, location of facilities and micro scale economic activities.

In a research project on social secure urban design (SUDD), all the 40 problem neighbourhoods were analysed from a social as well as spatial perspective. The deprived neighbourhoods can be classified in four groups, based on their spatial properties and three groups based on the socio-spatial classification. 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 and building style are inter-correlated. As it turns out, pre War neighbourhoods tend to have technical problems with the building mass. Some cases suffer from a segregated street network, but the streets are still inter-visible due to the way entrances are positioned to streets on ground floor level. Post War problem neighbourhoods suffer from low inter-visible streets and a spatially segregated street network. In the correlations between spatial and socio-economic values, the lower values on the spatial parameters, the lower the house prices and the higher crime rates (van Nes and López, 2013).

As van Nes and López state, what is lacking in the correlation between spatial and social parameters is that the available socio-economic data is on neighbourhood level and not on street level. This inquiry zooms into three different neighbourhoods in Rotterdam to reveal in detail the behaviour pattern of the users with the spatial parameters on a street resolution level. Therefore the following questions are at stake: What are the spatial parameters for generating street life between buildings in a neighbourhood? What kind of spatial features can contribute to generate social segregation or social integration? What are the spatial features of the areas dwellers perceive as safe and unsafe in their own neighbourhood?

2. The method

Heeling uses a layered model to analyse the various spatial and functional components of a city (Heeling et al, 2002). For this inquiry, the model needed some modifications (Figure 1 right).

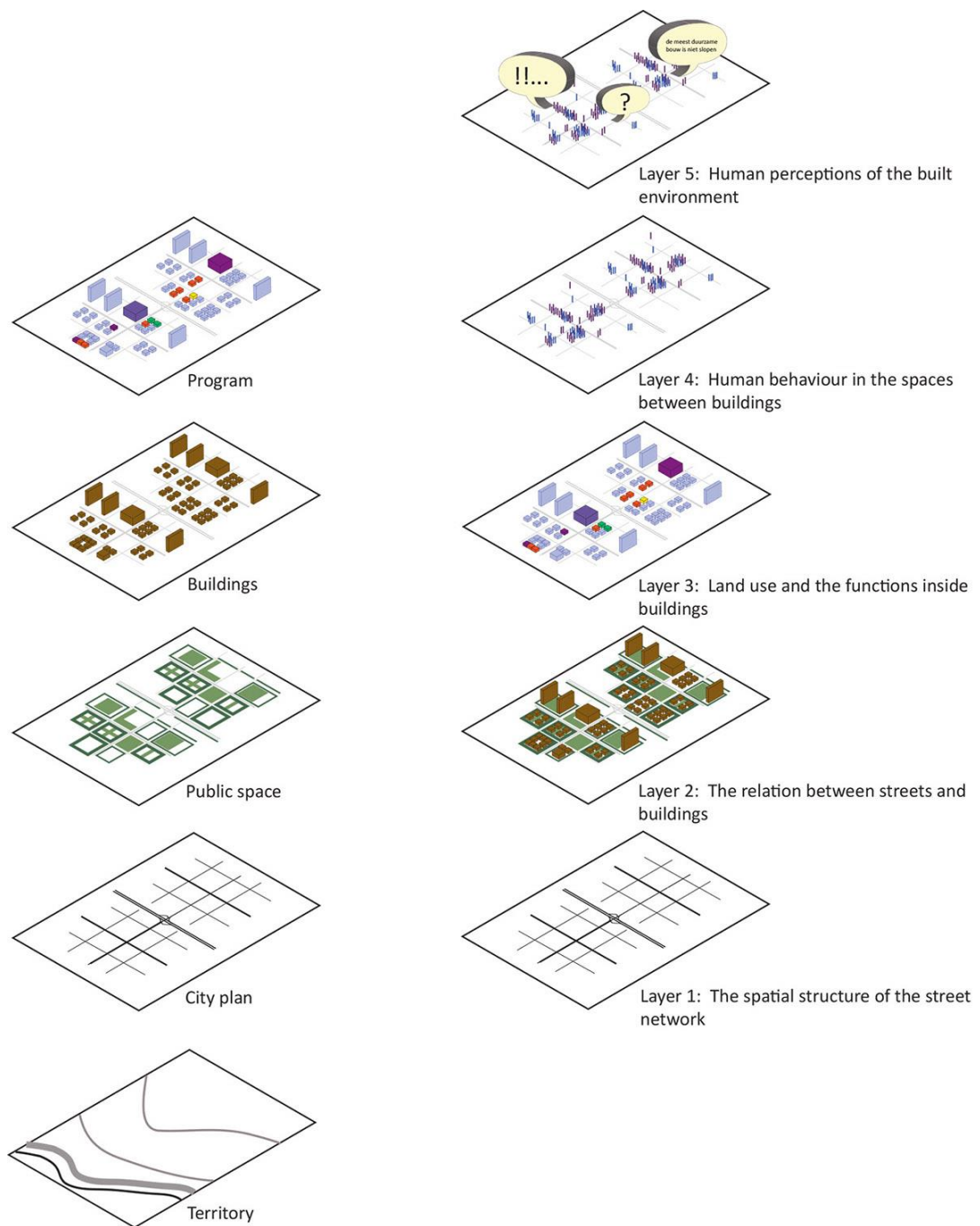


Figure 1: Heeling's model of layers of urbanism (left) and our multi layer approach (right) in this inquiry

2.1. The spatial structure of the street network

In the first layer the degree of interconnection between streets are quantified through Space Syntax analyses. A combination of angular analyses with various metrical radii is made for identifying the most locally accessible routes (the angular analyses with a low metrical radius) and the routes used by through travellers (the angular analyses with a high metrical radius). Where these routes coincide with each other, the most vital local shopping centres of an area are situated (van Nes and Stolk

2012). Inhabitants generally choose the metrical shortest route in their daily routines activities and change direction several times. Visitors tend to choose a route with the least direction change. As implied, some streets attract larger flows of visitors than others. The spatial layout of the streets therefore determines to a large extent the flow of traffic and the location patterns of shops (Hillier et al 1998).

2.2. The relation between streets and buildings

The urban micro-scale tools developed by van Nes and López (2010) are applied in the second layer to reveal the relationship between buildings and streets. The density and the degree of inter-visibility between front doors and between doors and streets are registered. These spatial relationships on micro scale level influence the liveliness and the degree of social control on streets. The more entrances and windows connected and oriented towards the streets on ground floor level, the greater chance that someone keeps an eye on the streets. Research has shown that streets with low degree of inter-visibility have high burglary rates (van Nes and López, 2010). Moreover, the perceived safety influences the appreciation of the area and is also dependent on the density of entrances and the degree of inter-visibility. If a street is perceived as unsafe, the street will be avoided, the social control will be even less and the street becomes unsafe (van Dorst, 2005).

2.3. Land use and the functions inside buildings

In the third layer, all functions inside buildings in the neighbourhoods are registered, such as commercial functions, sports, religious functions, schools, healthcare and cafes. Mixed land use ensures that many kinds of services are in close proximity, encouraging walking and cycling instead of private car use. In addition it enhances safety in public spaces through many people in streets (Jabareen, 2006). The addition of 'secondary' activities to primary purposes ensures the presence of people in streets and public spaces at different times of the day.

2.4. Human behaviour in the spaces between buildings

In the fourth layer, registrations on human behaviour show how different types of people use public space during a day. Jan Gehl (2008) defines 3 kinds of main outdoor activities: necessary activities (going to school or to work, going shopping and waiting for the bus), optional activities (strolling around or sunbathing) and social activities (playing, conversations and people-watching). All these activities place various demands on the physical environment.

In the static snapshots registrations, various types of human behaviour are grouped in the following categories: walking, standing, sitting and playing. Most of the time people walk, they are performing a necessary activity, and they have a specific goal in mind. "The fact that it is tiring to walk makes pedestrians naturally very conscious of their choice of routes" (Gehl, 2001, p.137). Several activities can be performed while standing in public space, such as waiting, talking, making a phone call, and looking at other people.

Sitting in public spaces encourage a wide range of activities. However, the difference with the standing activities is that standing is mostly a necessary condition to perform these specific activities, while sitting is often the primary activity and additional activities can be performed, such as reading, talking, playing a game, watching people or eating (Gehl, 2001, p.155).

Children perform mostly the playing activities. The behaviour of loitering youth is recorded separately. Groups of youngsters in public space are often felt to be threatening and annoying by others. These youngster groups can vary from two to many youngsters. Often these youngsters groups have no other goal than being with each other, standing sitting or walking and observing other people.

The following distinctions are made during the snapshot: Children, youngsters (teenagers), adults, and elderly. When overlaying the data from various time periods from the static snapshot registrations, a pattern of the most and the least frequented spaces can be seen. Likewise, a pattern on how different people use space can be revealed.

2.5. Human perceptions of the built environment

In the last layer, people's perception of urban space is registered through interviews. 60 randomly chosen people inside one of the neighbourhoods were asked to point out the areas they find unsafe and safe during day and night time on a map. The purpose is to reveal to what extent the perceived safe as well as unsafe areas coincide with the human behaviour pattern. Often the newspapers contribute to give a neighbourhood a more negative reputation than reality. In some cases the perceived unsafe areas can be in few streets of the neighbourhood.

3. The results from three case studies in Rotterdam

Rotterdam is the second largest city in the Netherlands and has the largest port in Europe. 611.000 inhabitants are living in Rotterdam, consisting of 169 different nationalities. The economic centre with new offices and shopping centre are located in the northern part, while the southern part consists of several deteriorated neighbourhoods and small urban centres. Rotterdam has the highest number of problem neighbourhoods in the Netherlands. The unemployment rate in Rotterdam is 8.5%, twice as the national average. Rotterdam South has even higher numbers. Moreover, some neighbourhoods in Rotterdam South consist of 95% non-western low skilled immigrants.

Rotterdam centre was heavily bombed in the Second World War, causing large housing shortages. Large scale housing areas with the principles from CIAM was implemented in the 1950's and 1960's. Rotterdam is since then worldwide known for its modern architecture. But the effects on the users are hardly discussed.

The three neighbourhoods studied are Pendrecht, Hillesluis and Het Nieuwe Westen. These areas are all classified as problem neighbourhoods, but they have different construction period.

3.1. Pendrecht – the post War neighbourhood

Pendrecht is a large scaled post war housing area designed by Lotte Stam-Beese according to the principles of the Modernism; light, air, space and a recognizable structure. Due to housing shortages after the War, Pendrecht was built in a short time. The basic unit of the neighbourhood is the block unit that could be repeated endlessly. In between the building blocks large green areas are implemented.

In a research project on liveability and safety from 2009, Pendrecht has high burglary and bag snatching rates, violence, and noise complaints compared to the other neighbourhoods. After the publication of the list of the 40 problem neighbourhoods in 2007, Pendrecht got a negative publicity as being on the second place on the list of 'worst neighbourhoods' in the Netherlands. Every incident was reported in the media, which damaged the image of this neighbourhood. Since then, a large amount of money is spent to improve Pendrecht's social structure. Parties and sports events are regularly organized.

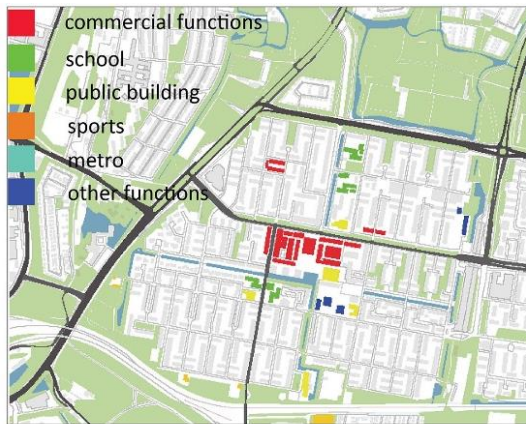
In the space syntax analyses of Pendrecht's street network (Figure 2), the red and yellow colours indicate a high integration and show the locally easy accessible routes (Angular analyses with a low metrical radius) and the routes that catch the trough travellers (Angular analyses with a high metrical radius).



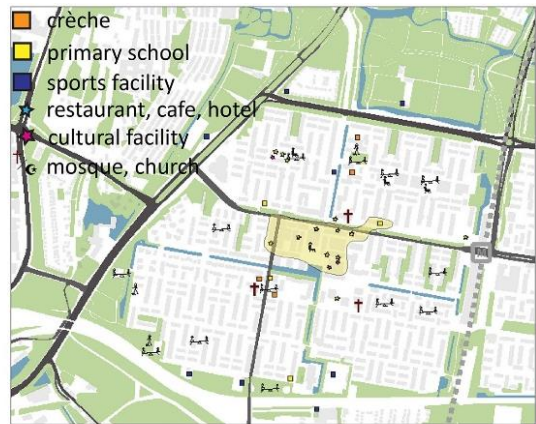
Figure 2: The macro and micro scale spatial analyses of Pendrecht's street network

In general, the whole neighbourhood is very segregated in all space syntax analyses. Even though the street pattern looks orthogonal at the first sight, Pendrecht's low integration values are caused by that the area is disconnected to its surrounding neighbourhoods and Rotterdam's main route net. Moreover, several streets end in a "T-junction" inside as well as at the edges of the neighbourhood. The neighbourhood's main road 'Slinge' is slightly highlighted in the angular analyses with a high radius. The most integrated main routes are located outside the neighbourhood. In the angular analyses with a low radius, the silent dwelling street Sliedrechtstraat is highlighted. It is located on a different place than Slinge. There are no streets that form a strong vital centre in Pendrecht. The

shopping centre is located on the side of Slinge, which is the only part of Slinge that has both middle values on the metric low and high radii of the angular analyses, and that has buildings with active frontages towards Slinge.



Dispersal of functions in Pendrecht



Dispersal of activities in Pendrecht



The street Sliedrechtstraat



The street Slinge, Pendrecht's main shopping street



People standing at the entrance of a shop



People sitting on a public bench at the main square Plein 1953

Figure 3: The registration of functions and facilities in Pendrecht

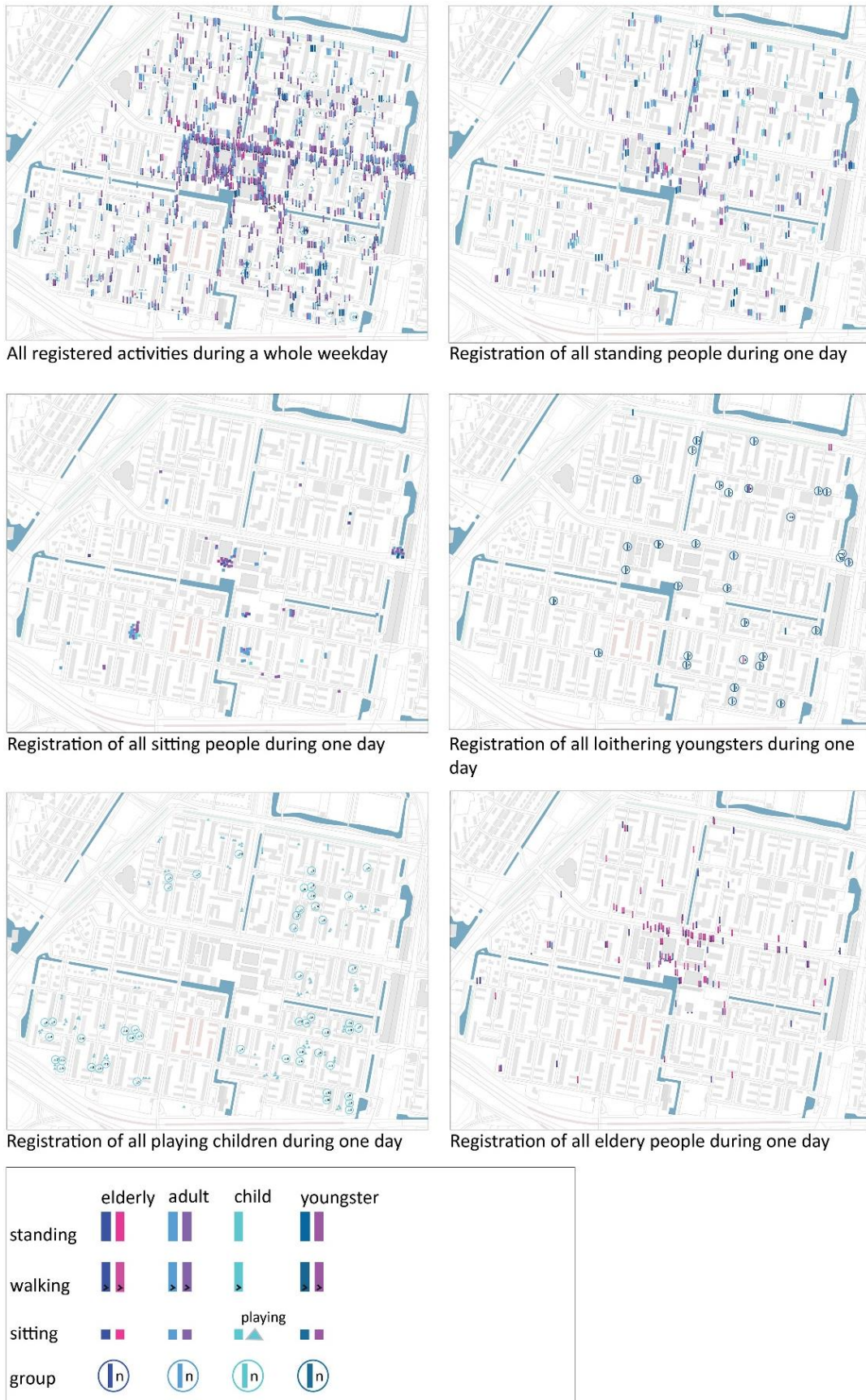


Figure 4: The registration of human behaviour in Pendrecht

In Pendrecht the density of entrances varies per street. There are several streets with a density lesser than 0.5 entrances per 10 meter. There are also several streets with more than 1 per 10 meters (Figure 2 below). However, the degree of inter-visibility between entrances is low for the most of the area.

There are few variations in Pendrecht's building facades. The area consists of mostly flats having blind walls on the ground floor level. There are a few row houses with front doors to each home with a small doorstep or a small front-garden. Moreover, there are several streets faced by only the short sides of houses with blind walls. In the centre there are some delivery roads where only the presence of front doors indicate that people are living there. These streets lack any kind of active functions on ground floor level.

Most streets with the flats consist of storage rooms at ground floor level. The distance between the doors to the apartments are around 20 to 30 meters. Sometimes the blind walls are hidden behind shrubs. Most streets in Pendrecht lack front doors along streets, which contribute to an overall low degree of inter-visibility and density of entrances. Therefore the social control between buildings and streets is low. In general, all inter-visible streets are the most segregated streets in a north-south direction, while streets with the highest local integration values are in an east-west direction. The shopping centre at Slinge is the only place where the highest integration of the street network with high density and inter-visibility of entrances coincide.

Figure 3 shows a map with the dispersal of various functions and facilities in Pendrecht. Most of the commercial functions are concentrated in the shopping centre of the area and along the street Slinge. The four corners of the neighbourhood have exclusively a living function except from the playgrounds that are equally spread over the area (Figure 3 upper left).

Static snapshot registrations of Pendrecht were carried out on a Friday in September 2011 (Figure 4). There is a high concentration of people between the metro station and the neighbourhood centre, and inside the neighbourhood centre. The lowest number of people in streets is in the living areas in the south and especially in the southwest. As concluded, during the day the presence of people in the centre is determined by the presents of the shops and metro stations. After shops' closing time, most streets in the area are empty. The few activities take place along and in the vicinity of the main road Slinge.

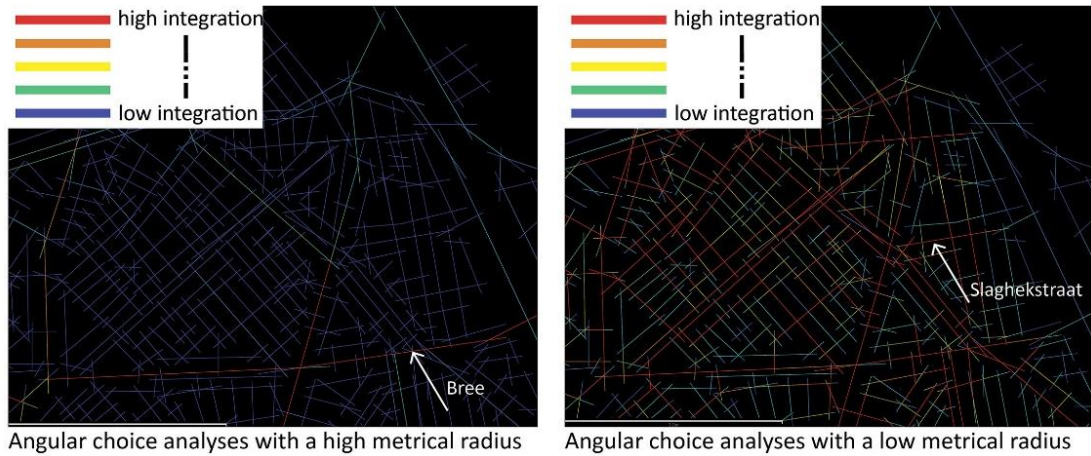
All standing and sitting people are found along streets with active frontages. Few people are standing with a social purpose. Most of the time it is in combination with necessary activities such as waiting for the bus, standing at a cash machine or making a phone call. The only public space where people are sitting is the square at the commercial centre. In some inter-visible streets, people are sitting in the front yards and doorsteps of the dwellings.

Most children are playing outside at the playgrounds inside the dwelling areas between 2 p.m. and 6 p.m (Figure 4). The elderly are mostly in the centre of the neighbourhood. Few elderly are observed in the neighbourhood's southern part. After 6 p.m. when the shops close, all old people disappear from the street. The groups of loitering teenagers are located in the neighbourhood's eastern part, in segregated streets with blind walls. These youngsters are mostly walking, sitting in and around their cars or in playgrounds.

According to the results from the interviews, the shopping centres are perceived to be safe during shops' openings hours and unsafe during closing hours. Un-constituted segregated streets with no inter-visibility are perceived to be unsafe. In particular the segregated streets in the southern part are perceived as a scary 'no-go' area. The un-constituted streets at the metro station are pointed out by to be a risky place for purse snatching. Integrated streets with windows and doors connected to it are perceived to be the most safe and lively areas.

3.2. Hillesluis – the sub-urban pre War neighbourhood

Hillesluis is built from 1910 to 1930. It is a multicultural neighbourhood. 30% of the dwellers have Turkish origin. Only 19% of the inhabitants are Dutch. Hillesluis has a lively long shopping street; the South Boulevard. In 2008 Hillesluis came on the list of the 40 problem neighbourhoods. In the safety index of 2009, Hillesluis is in the top 3 of the un-safest neighbourhoods in Rotterdam. In 2009 high rates on intimidation, violent crime, drug-related crime, vandalism, harassment, drunkenness and trouble with groups of youngsters are registered (Gemeente Rotterdam, 2009).



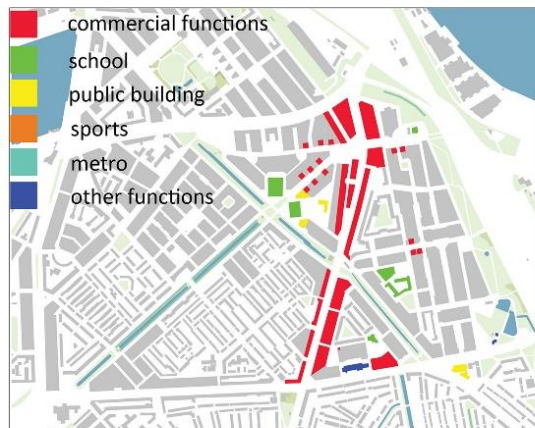
Street with both low inter-visibility and density of entrances



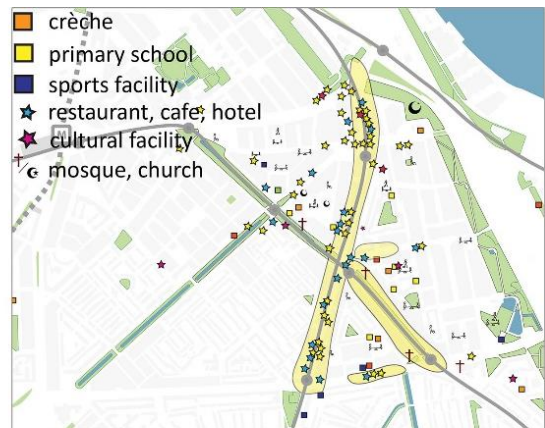
Street with high density but low inter-visibility of entrances

Figure 5: Macro and micro spatial analyses of Hillesluis

Figure 5 shows the spatial analyses of Hillesluis. In the angular analyses with a high metrical radius, the main routes through the neighbourhood are highlighted. The most integrated routes are the roads at the edges of the neighbourhood and the main shopping street. When applying a lower metrical radius, more local dwelling streets are highlighted. The vibrant local shopping street has high integration values on both a low and a high metrical radius.



Dispersal of functions in Hillesluis



Dispersal of activities in Hillesluis



The street Bree



The street Slaghekstraat



People standing on a square



Loitering youth in Hillesluis

Figure 6: The dispersal of functions and facilities in Hillesluis



All registered activities during a whole weekday



Registration of all standing people during one day



Registration of all sitting people during one day



Registration of all loitering youngsters during one day



Registration of all playing children during one day



Registration of all elderly people during one day

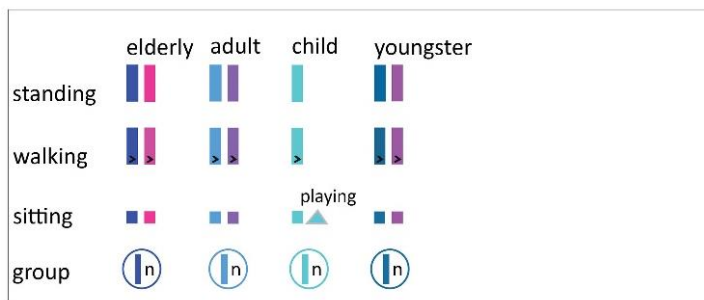


Figure 7: The registration of human behaviour

Figure 5 below shows the micro scale analyses of the relationship between buildings and streets in Hillesluis. In comparison with Pendrecht, the density and inter-visibility of entrances are high. Most of the front doors are entrances directly to individual dwellings, with a small doorstep, elevated entrances, or entrances next to shops. In some streets front doors give entrance to several apartments.

Figure 6 shows the dispersal of functions and facilities in Hillesluis. Most commercial functions are located along the South Boulevard axe. Other functions such as small local corner shops are distributed over the area.

On a Friday and a Thursday in October the registration of human behaviour in Hillesluis was carried out. As Figure 7 shows, a large concentration of people are located on the South Boulevard and in some of its side streets. More people are standing in public space in Hillesluis than in Pendrecht. Several men are standing in front of garages or are busy with washing or repairing their cars. Only a few people sit in the public spaces during the day, due to some rainfall causing wet benches during the registration day. Children are playing at the playgrounds inside the dwelling areas, and the elderly are located mostly in the highest integrated streets. The youngsters are located one direction change away from the most integrated streets and main routes, but in streets with low degree of inter-visibility of entrances.

In general, Hillesluis has far more variation in the types of shops than in Pendrecht. The largest concentration of people is where the location pattern of shops is located, which again is along the most inter-visible and locally integrated streets with a high as well as a low metrical radius. This shopping street has developed naturally as the city expanded after 1900.

3.3. Het Nieuwe Westen – the urban pre-War neighbourhood

Het Nieuwe Westen is a pre War neighbourhood built at the beginning of the 19th century. It is a multicultural neighbourhood, but the largest group (28%) are of Dutch origin. The Turkish, the Moroccans and the Surinamese inhabitants are the same size and represent 45% of the inhabitants. The Vierambachtsstraat is a long shopping street separating the northern part from the southern part of the neighbourhood.

In the list of the 40 problem neighbourhoods from 2008 only the north part of het Nieuwe Westen is mentioned. However, in the national safety index, the whole neighbourhood was considered as problem area. The reason for this distinction is unclear. Compared to Hillesluis and Pendrecht, the Nieuwe Westen has the least problems with crime rates. Only car theft and car related vandalism rates are high.

Figure 8 shows the micro and macro spatial analyses of Het Nieuwe Westen. In the angular analyses with a high metrical radius, the main routes are located around the neighbourhood, except from one main route leading towards Rotterdam centre. In the angular analyses with a low metrical radius, some local shopping streets are highlighted.

The density of entrances in 'het Nieuwe Westen' is in general high in comparison with Pendrecht. At the edges of the neighbourhood, the inter-visibility is rather low, compared with the neighbourhood's core. Barriers surrounding the neighbourhood, such as large canals and rails, causing segregated and low inter-visible streets.

The closed building block is the dominating building type. Some small variations between front doors are found in the area, mostly entrance into single-family dwellings. Some exceptions are the doors to 4-6 apartments and the urban renewal project located along the street Heemraadssingel. These housing projects from the 80's consist of large premises accessible by large staircases from the street.

In the registration of the functions and facilities, the most commercial functions are located along the two most integrated streets going through the area. The other functions and some small corner shops are equally distributed over the neighbourhood along streets with high integration values with a low metrical radius.

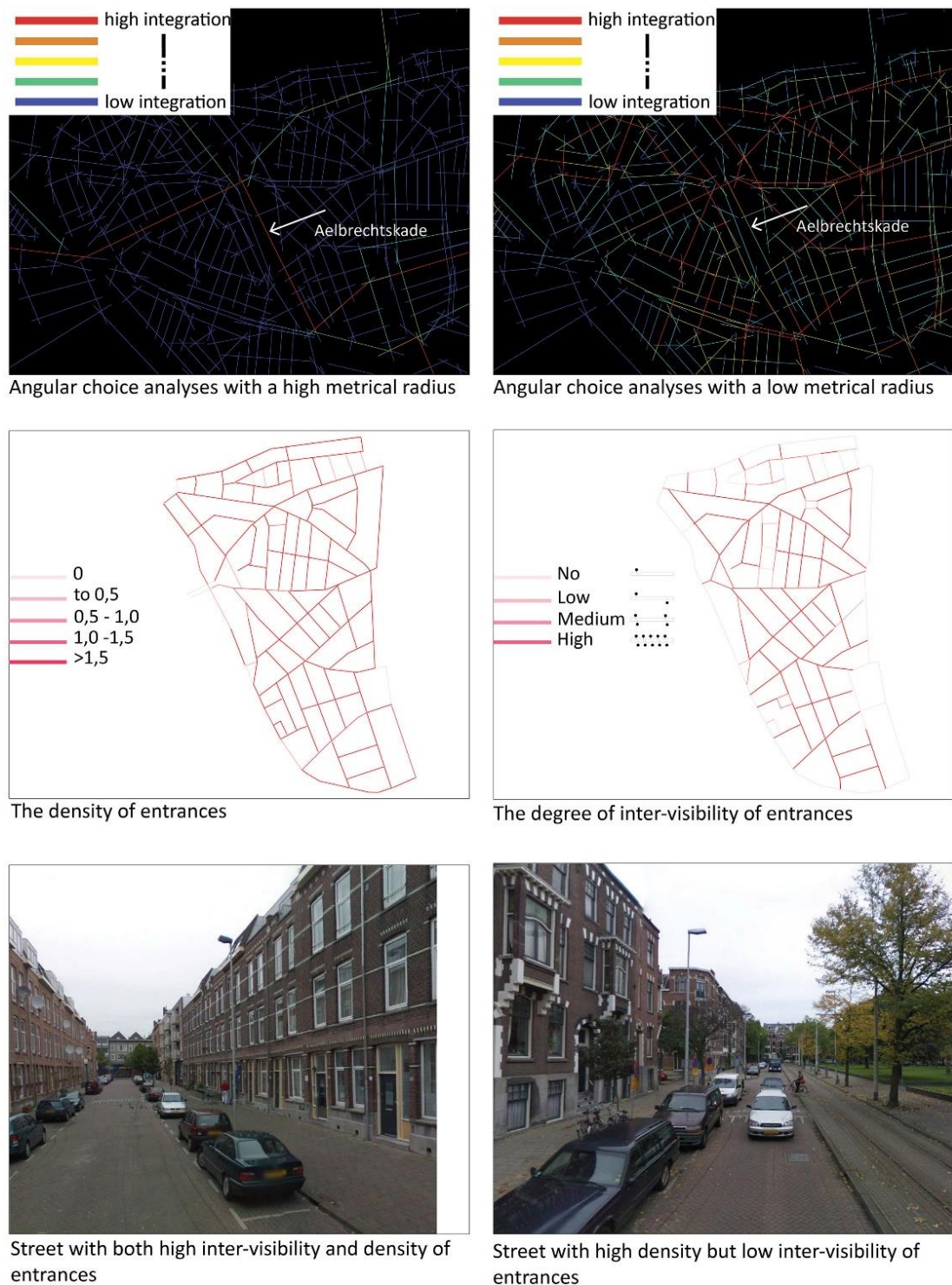
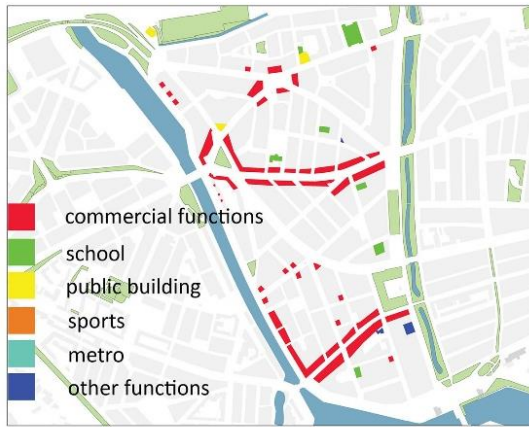
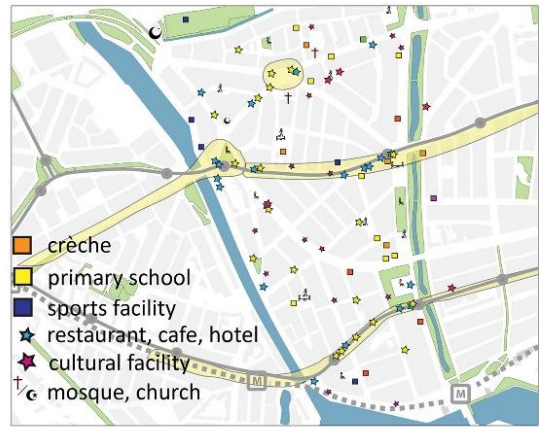


Figure 8: The spatial analyses of Het Nieuwe Westen



Dispersal of functions in Het Nieuwe Westen



Dispersal of activities in Het Nieuwe Westen



The street Aelbrechtskade



The two bridges that connect Het Nieuwe Westen with neighbourhood on the west



People sitting on a square



Loitering youth in Het Nieuwe Westen

Figure 9: The registration of functions and facilities in Het nieuwe Westen

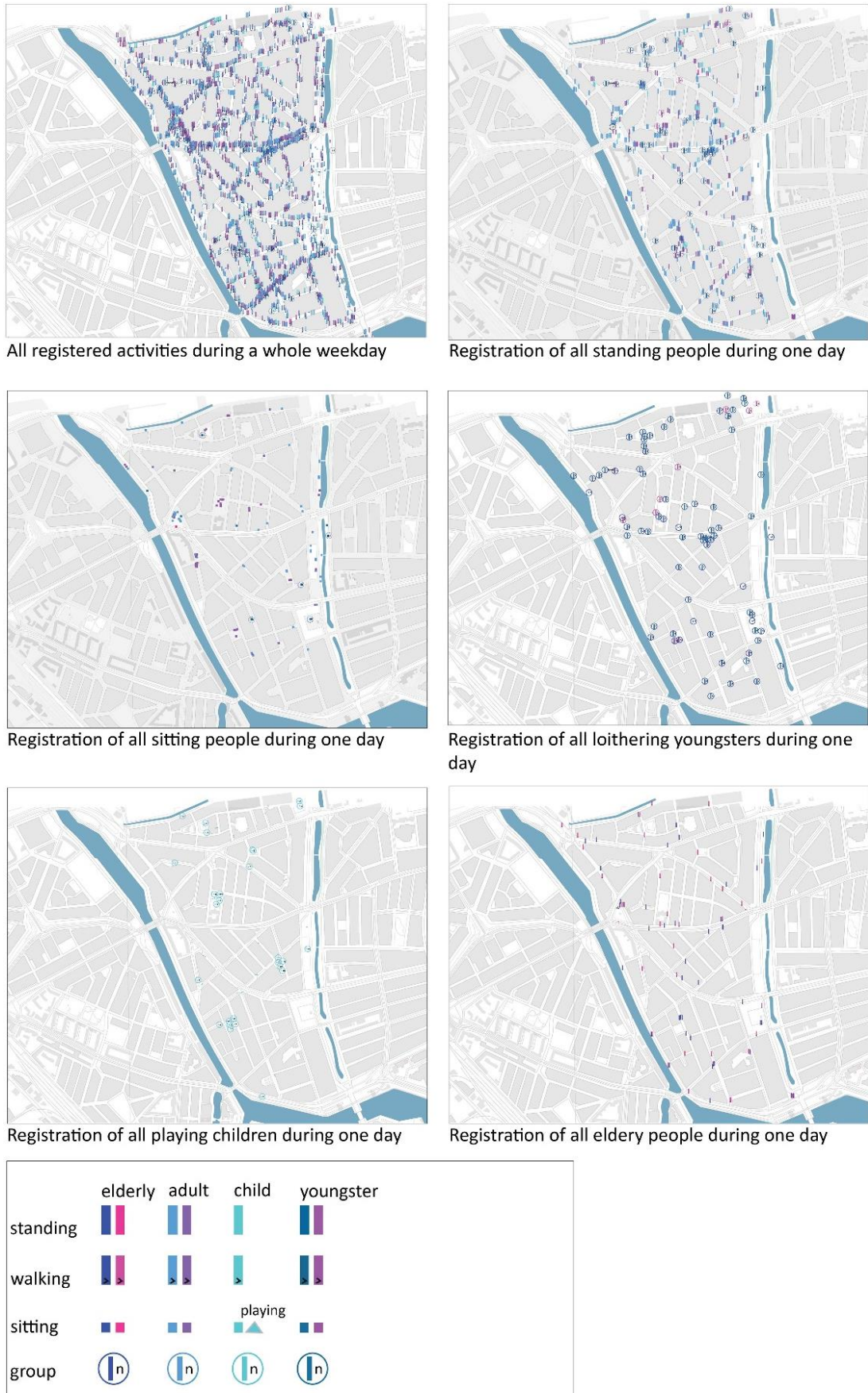


Figure 10: Registrations of human behaviour in Het Nieuwe Westen

On a Thursday in October 2011 the registration of human behaviour of Het Nieuwe Westen was carried out. As Figure 10 shows, a large concentration of people takes place along the most integrated main routes through the area and along streets with high spatial integration with a low metrical radius. There are high numbers of groups of standing men in front of a mosque or a coffee/teashop. Most people are sitting on squares and other open spaces.

Most children play in squares and playgrounds inside the residential areas. The elderly people are located all around in the neighbourhood. Groups of loitering teenagers stay along the main road as well as in segregated streets. Most of these youngsters are standing on corners around the whole neighbourhood.

4. Comparison and discussion

When comparing the neighbourhoods with one another, the pre War neighbourhoods are more spatially integrated on micro and macro levels than the post War neighbourhood. Likewise, the pre War neighbourhoods have more inter-visible streets with high density of entrances on ground floor level than the post War neighbourhood. The most integrated main routes goes through the pre War neighbourhoods, while they go around the post War neighbourhood. The effect is that the shopping streets in pre War neighbourhoods are vibrant with a large variation of different types of shops. The location pattern of shops is linear. In the Post War neighbourhood, shops tend to cluster together in a shopping centre located in the middle of the neighbourhood, located along the main route with the highest spatial integration values with a high and a low metrical radius. The variation of the types of shops is rather low.

When revealing the behaviour of people inside the neighbourhoods, the spatial layout affects how people behave in public space. In the pre War neighbourhoods, a mixture between women and men, elderly and young people can be seen in the main shopping streets going through the areas. In the post War neighbourhood, there is a large concentration of people in the shopping centre during shops opening hours. After closing time, the area is deserted.

The perceived unsafe areas are in spatially segregated streets with the lowest integration values and buildings with blind walls. The spatial structure seems to influence the amount of people in streets, which again influence the perceived safety of a street. Obtaining place bounded crime data from the police for Rotterdam has not so far been successful. Otherwise, these data would contribute to reveal the relationship between perceived safety and real safety from a different perspective.

5. Challenges for urban renewal in problem areas

Only five decades after the implementation of the CIAM ideals, the socio-economic problems are much larger in post War than in pre War neighbourhoods. First of all, the spatial structure of the street and road net is different in pre War neighbourhoods than post War neighbourhoods. Therefore, different regeneration approaches are needed in upgrading problem neighbourhoods.

When improving a pre War neighbourhood, it requires linking the main routes running through the area to surrounding neighbourhoods or to the rest of the city. The purpose is to get a natural flow of visitors travelling through the area, in which enhance the natural police mechanism and establishment of micro scale businesses inside a problem neighbourhood. Otherwise, other smaller challenges are to remove the blind walls near schools, public squares and playgrounds for increasing the social control on these public spaces. For the rest, the technical standards of the dwellings or enhancing a larger variation of types of dwellings are needed in pre War neighbourhoods. These kinds of neighbourhoods tend to have large gentrification potentials, due to a good spatial structure on a macro as well as micro scale level of its public spaces.

When improving a post War neighbourhood, more improvement challenges on the spatial layout are needed than the pre War areas. On a macro scale level, the broken up street net needs to be improved. Likewise, an integrated main route well connected to side streets and to surrounding neighbourhoods need to be enhanced. On a micro scale level, all storage rooms on ground floor levels needs to be replaced with active function such as dwellings, offices, shops etc. The kind of function depends on the degree of spatial integration. If the spatial integration is low, then a dwelling function can be enhanced. If the spatial integration is high, shops can replace the storage spaces on ground floor level. The perceived security can be improved through an active frontage on ground floor level of all buildings. The inward oriented shopping centres need to be linked to a main route going through the area. At least, the right spatial strategies for the right type of neighbourhood can support an upward socio-economic development spiral.

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