Spatial Information for Governance: Discovering E-grievance Hotspots with Spatial Autocorrelation to Reveal Causal Factors

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March 2011

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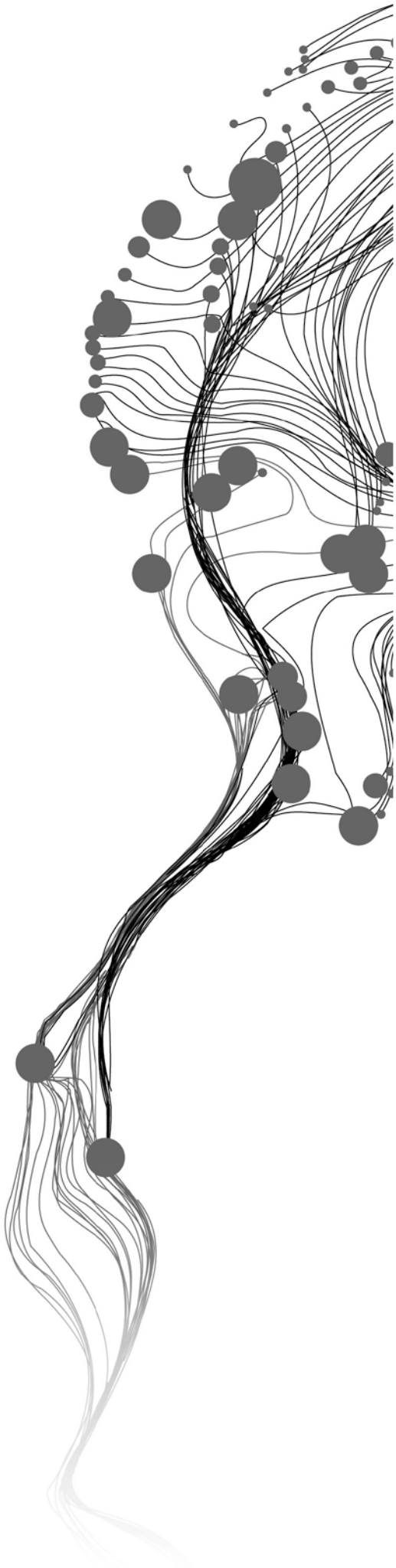

Spatial Information for Governance: Discovering E-grievance Hotspots with Spatial Autocorrelation to Reveal Causal Factors

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ABSTRACT

Spatial analysis can provide clues for in-situ solution of urban governance problems. Using e-grievance data from Enschede, Netherlands, hotspots were mapped according to type and their clustering across neighbourhoods was observed. Visualization revealed that ethnicity and income strongly correlate with some grievances. Garbage dumping is the problem of low income and mostly non-Western immigrants while greenery maintenance is the concern of middle income Western Europeans in the city outskirts. No problem clustering was observed for the upper middle class. This study shows that the analysis of spatially-referenced information can help decision-makers arrive at better solutions for urban problems. The caveat is that the latter are caused by a combination of macro and micro-level factors and should be dealt with accordingly.

Keywords: e-government, e-grievance, ICTs, neighbourhood incivilities, urban governance, spatial analysis

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Knowledge does not sprout out from the blue. Usually, it is a gathering force starting from its smallest forms to one which, like the mid-day sun, beams on wide swathes of the earth. Reaching the latter requires a million inspiration, thousands of tutors, a multitude of tools, and countless hours of toil.

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I sum up my brimming gratitude in my native Tuwali Ifugao tongue shouting, *Haggiyo ke dakayun am-in!* (Long live ye all!)

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1. INTRODUCTION

1.1. Foreword

The city is a melange of different peoples coming from different origins, income levels, and skills. It is unique in that a huge population congregates and lives in its often limited space. Thus, it needs a different kind of governing, of an intervention that's uniquely-designed according to the specific needs of its multifarious inhabitants and the tensions and problems created by such a huge gathering.

In 1890, Simon (as cited in Diamond & McLoughlin, 1973) wrote about the problems that the 'lower class' was facing- very low wages and increasingly high housing rent because of their high numbers leading to 'starvation wages' and unsanitary living conditions. Today, after 120 years, his observations remain facts. The retrenchment of Fordist and Keynesian principles and their replacement by neoliberal aims in the late 1970s, coupled with unfettered globalization have not resulted to better quality of life in the cities especially for the urban poor. There is a big gap between the haves and the have-nots.

While the rich and middle income live in fine houses, the urban poor have to deal with living in social rented housing of mostly dilapidated flats. In neighborhoods where the poor congregate, there is evidence everywhere of disorder or incivilities. Littering and vandalism mark the scene, echoing fear in the streets. Children- as well as the elderly- can be hardly seen outside as they spend more time indoors. Adults find it hard to get employment, partly because of low skill qualifications, and partly because of 'place-shaming' making them more susceptible to vices such as alcohol and drugs (Innes & Jones, 2006; Sampson, 2009).

Urban governance, the response to the ever-growing changes and challenges in managing the city, is defined in various ways. According to Diamond and McLoughlin (1973), it is a combination of "formal, central control..complemented by the activities of many agencies, statutory and voluntary steering bodies" (p. 8) and influenced by community individual and group actions. The UN Habitat website characterizes it as having the "interdependent principles of sustainability, equity, efficiency, transparency and accountability, security, civic engagement and citizenship" (UNHabitat, 2011). The key idea is to bring in the active participation of individuals and groups outside the formal structures of government. Thus, the private sector, civil society organizations, and individual persons are deemed important contributors towards the solution of various concerns and challenges that an urban setting brings.

Responsiveness to citizen stimuli is the sine qua non of governing. Government exists, as the 17th century English philosopher Thomas Hobbes posits, to veer away from the state of nature he characterized as "solitary, poor, nasty, brutish, and short" (1651, p. 84). To be effective in its role of facilitating harmonious co-existence of its citizens, it has to craft and implement policies and laws that are attuned to the realities and problems 'on the ground'.

Urban problems are usually a combination of macro and micro-level factors. While maybe unique to a city, neighborhood, or block, larger structural mechanisms facilitate these phenomena. Therefore, there is a need for proper, area-specific interventions combining policies and actions which range from the highest levels of government down to the lowest levels of aggregation like the neighborhood or block.

1.2. Problem Statement

Enschede is one of the cities affected by major global socioeconomic and political shifts in the 1970s. A government solution is to break the clustering of poor households in certain neighbourhoods through the

process of 'social mixing', defined as income heterogeneity, by replacing a portion of social rented housing with more expensive units. The idea is that enhancing housing stock would improve the socioeconomic standing of these areas and reduce associated problems such as low liveability, crime and incivilities.

There are different explanations on what cause incivilities though. Pathological theories point out cultural and individual factors such as race, ethnicity and level of job skills as determinants of a neighbourhood's degree of disorder and crime (Lewis, 1963). Theories of *structuration* suggest that wider socio-economic infrastructures such as the regional economy and racism can impoverish certain people leading to deviancy (Massey & Denton, 1987). Social cohesion theory posits that a heterogeneous mix of socio-economic and demographic variables create avenues for unseemly neighbourhood behaviour (Sampson & Raudenbush, 2004). However, most of the studies do not zoom in into a micro-neighbourhood or street level to validate these causal explanations nor use empirical evidence as these are usually based on people's perceptions. A few exceptions try to explain safety, satisfaction perceptions and racial segregation with street and neighbourhood-level socio-economic and ethnic factors (Hipp, 2007, 2010; Lee, et al., 2008).

Incivilities are among the complaints addressed in a new application in e-governance, the 'e-grievance' mechanism. Traditionally, grievances are communicated directly by the complainant to the concerned office/s. E-grievance is hassle-free as reporting and feedback are systematized in one portal. Front desk operators answer telephone calls and receive online messages, categorizing and coursing them to concerned offices. The messages and responses can be traced back to their origin ensuring transparency (Martinez, Pfeffer, & van Dijk, 2009, p. 4).

In the Netherlands, Enschede is one of the pilot areas in e-government. From a national pilot project in 1996 which involved a 'one-stop-shop' for 'building and living' of the then Ministry of Home Affairs, its electronic services have grown to 'products' ranging from general information to where transactions are possible (Leenes & Svensson, 2005, pp. 19, 31)- including the lodging of complaints and messages.

While e-grievance mechanism is used as a reactive tool, i.e. the submission of complaints would lead to action, its huge database can be tapped to measure problems, where they happen, and why. This can help in the crafting and implementation of policies that effectively address these issues.

This study will look at the complaints of Enschede residents sent to its e-governance portal/digital counter (www.loket.enschede.nl). The objective is to analyze causal factors below the neighbourhood level of aggregation. With the aid of a GIS spatial statistical tool, problems can be identified and studied where they exactly happen. With visualization, results can present a more credible evaluation of causal factors. Furthermore, a comparison with a-spatial statistical analysis of neighborhood-level data would reveal whether street-level realities are accurately captured in higher-level aggregate data.

1.3. Research Objectives and Questions

The main objective is to determine the factors influencing complaints and messages in Enschede, Netherlands. The following table presents the specific objectives and corresponding research questions:

Table 1: Objective and Corresponding Research Questions

Objective 1: Determine the causal factors of complaints and messages	
Specific Objective	Research Question
1. Determine the occurrence of complaints 'hotspots' and their clustering in space	Do complaints 'hotspots' occur? Is there a clustering of 'hotspots'? Which complaints occur together?
2. Determine characteristics of complaints by visualization	What are the specific socio-economic and spatial characteristics of these 'hotspot' clusters?
3. Compare results of spatial autocorrelation of street-level data with multiple regression analysis of neighbourhood-level data	Do the two different statistical tests on two different levels of data aggregation support each other?

1.4. Research Framework

This study follows a series of steps from conceptualization until the formulation of conclusions and recommendations. Literature to be reviewed will come from Urban Governance, Neighbourhood Incivilities, and E-governance from where a conceptual framework will be derived. The latter will guide data analyses and frame the discussion of the results through conclusion. The figure below simplifies these steps:

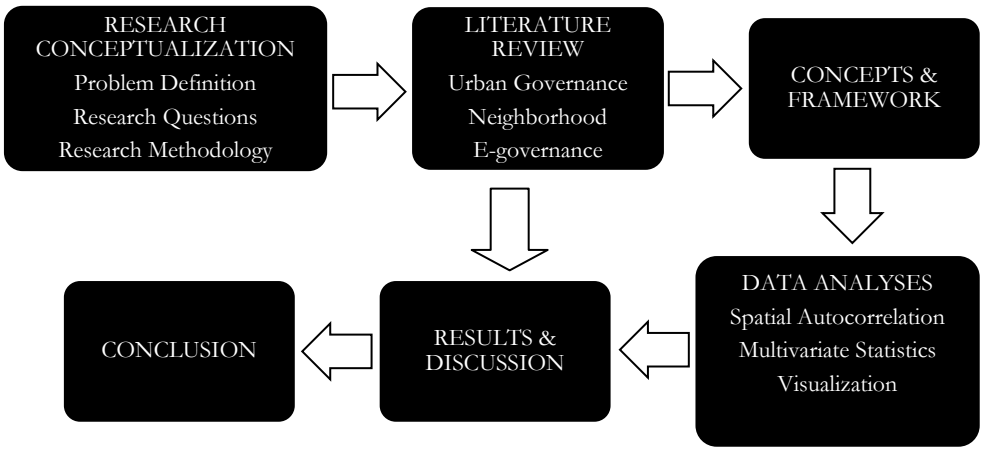

Figure 1: The framework of research

1.5. Research Methodology

Identified in the e-grievance section of the Enschede Digital Counter are several types of complaints and messages on the living environment. These have attributes of type, neighbourhood, and street. Thus, complaints can be matched with the streets where they come from revealing what types of complaints cluster where. Moreover, while socio-economic data exist only on the neighbourhood level, these can also be measured at the lower street level of aggregation by the characteristics of adjacent housing and other phenomena that exist in space. The following figure shows this:

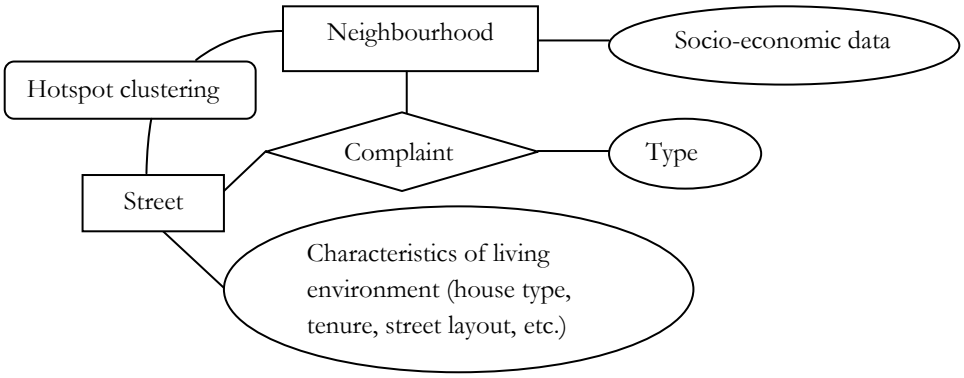

Figure 2. Spatial conceptual schema of e-grievances

To have a crisp understanding of the causes of grievances in Enschede, there is a need to conduct spatial autocorrelation and subsequent visualization of output maps to identify areas where hotspots cluster and understand their respective causal factors. Furthermore, there is a need to conduct a-spatial statistical test on neighbourhood-level data to determine if it matches the spatial analysis of lower level aggregate data.

1.6. Limitations of Study

This study was conducted with two major constraints. First is the researcher's limited knowledge of the study area, including but not limited to its history, cultures and traditions, norms, and politics. Thus, the interpretation of results may not entirely capture the reality as perceived by long-time residents of the city. Second is the language barrier. Although there are available translation tools online, these are often limited to basic sentence formats that an intimate knowledge of the local tongue would be needed for a more in-depth understanding of Dutch language texts. Related is the case of important journal articles wherein the researcher had to look for available issues in English- at times, there were none.

2. GOVERNANCE, NEIGHBOURHOOD, & E-GRIEVANCE

2.1. Urban Governance

Pierre (2005) says that there are three ways to understand urban governance. Either it is a theory or point of view which looks at other institutions, processes and mechanism beyond government affecting the outcomes of desired objectives, a normative model which prescribes a shift of top-down government approach to a partnership with the private sector and other non-government groups at the local level, or as an empirical phenomenon. In line with the aforementioned, urban governance is defined as a mix of policies that: a. replace 'universalistic' programs with 'targeted policies'; b. an increased recourse towards 'covenants'; c. a merging of related departmental policies into single projects; and d. in situ problem solving within cities and neighbourhoods (Andersen & van Kempen, 2003).

2.1.1. Spatial Information for Urban Governance

Urban governance with its focus on 'targeted' and in situ solutions rather than 'universalistic' programs should be based upon a bedrock of information. The more that is known about a problem, issue or situation, the better fit solutions and responses would be. Policy and decision-making and resultant actions should be exercised with the maximum use of information available. This is informed governance or evidence-informed policymaking (Oxman, Lavis, Lewin, & Fretheim, 2009).

Continued growth in earth survey and observation such as the installation of more powerful satellites and the development of advanced geographical information systems (GIS) software are improving ways in which land-related information or spatial data are interpreted and used for a variety of purposes (Caiaffa, Cardinali, Screpanti, & Valpreda, 2008). Originally a mainstay of land information systems/*cadastres* and geological enterprises, the use of earth observation tools and techniques have spread to other areas as well such as such as medical science, criminology, and business, among others.

Aside from its extensive use in land information systems, spatially-referenced data can be used to enhance policy-making as a multitude of issues and problems are reflected upon maps and their locations observed at pinpoint accuracy with a variety of GIS tools and techniques (Wallace, Williamson, Rajabifard, & Bennett, 2006). According to Lewis and Ogra (2010), there are a variety of yet largely-unexploited possibilities for GIS to be used as tool in policy-making in addressing main concerns in urban governance such as the provision of services, equitable citizen access to these services, infrastructure delivery, and the measurement of citizen approval. The addition of spatial information to traditional drivers of policy and decision-making such as policy analysis, quantitative studies based on a-spatial statistics, qualitative research, and debates can improve governance. While feminist critique point out that GIS capture of spatial data on the neighbourhood level reinforces power to the government (Derickson, 2009; Elwood & Leitner, 2003), this research argues that it complements other methods of information-gathering and should not preclude the use of other equally-important tools of study.

2.1.2. The Crisis of Peripheral Cities

Brenner (2009) says that there was a shift in the style of managing urban areas in the United States as well as Western Europe following global socio-economic and political changes in the 1970s. Previous to this period, Western states were modelled after Keynesian principles which forwarded the idea that the actions of the private sector can sometimes result in macroeconomic inefficiencies thereby requiring active government involvement, including monetary and fiscal policies and interventions. Government resources were, at best, distributed evenly across incomes and across sub-national governments. Moreover, Fordist principles catered for the basic rights of the common workers as mass production and mass consumption

went hand in hand. All of these changed as the welfare society retreated, governments decentralized and the role of the private sector grew.

Western European governments, aping the United States, promoted "contemporary urban locational policies" or "Rescaled Competition State Regimes" (Brenner, 2009, p. 41) characterized by two aspects: 1. The devolution of major tasks of economic regulation to local institutional levels; and 2. A focusing of investments in the most globally competitive urban conglomerations and cities. These have led to the retrenchment of equality and redistributive welfare principles and the exacerbation of intra-national socioeconomic differences. Peripheral regions and cities which are already experiencing economic decline due to international forces such as globalization are forced even more to tighten their expenditures as central governments focus on investing in the most globally-competitive regions and cities. In a more minute scale, forms of social and spatial exclusion, specifically the marginalization of "excluded people" (Lang, 2010, p. 5) become more apparent in certain neighbourhoods.

2.1.3. Urban Restructuring in the Netherlands

From agents of welfare and public service, local government units have turned into entrepreneurs devoted towards the economic development of their respective territories. The situation is now a competition between cities as each tries to attract much investment as it can. Issues of wealth redistribution and equality are relegated to the backburner as economic growth is the main cause for action.

Privatization and contracting are bywords as local governments struggle with budgetary limits from the national government. Agencies which are deemed unproductive are either sold to private companies or abolished. Moreover, local governments shift from welfare provision to attracting investments from national or global undertakings. Lastly, new programs and policies are introduced to stimulate economic growth within cities. These comprise a range of policies on the labour market, industry, infrastructure, and housing redevelopment (Brenner, 2009; Lang, 2010; Raco, Turok, & Kintrea, 2003). Included in the last group of initiatives is the so-called urban restructuring, aimed at 'social mixing' which involves tearing down a portion of social housing units to be replaced by more expensive high-end dwellings for the middle class. The primary logic is that a mixture of different types of houses will reduce the poverty in the area, including its related problems, thereby improving its economic standing.

In 1997, the Netherlands' Ministry of Housing, Spatial Planning and Environment (*Ministerie van VROM*) issued a policy paper declaring the start of urban restructuring with the end goal of 'social mixing'. The plan is to reduce the percentage of social rented housing from 65% to 42% and increase owner-occupied from 18% to 45%. This requires a restructuring of 170 neighbourhoods and involves the reduction of social housing units by 94, 000 (as cited in Uitermark, 2003). According to Uitermark (2003), this is part of the Big Cities Policy which aims at improving the economic status of the largest cities.

Researchers criticize the current urban restructuring policy targeted at breaking neighbourhood 'concentrations' (Bolt, 2009; Bolt, van Kempen, & van Ham, 2008; Uitermark, 2003). Bolt, van Kempen, and van Ham (2008) argue that urban renewal is premised on three simplistic assumptions: 1. Ethnic segregation contradicts integration into Dutch society; 2. Mixing facilitates interaction between different social groups and the realization of role models; and 3. Ethnic segregation is a function of poverty therefore mixed housing will lead to a heterogeneous neighbourhood. They counter that the first assumption does not take into account the possibility that ethnic clustering has positive benefits, the second goes against research showing that ethnic mixing does not lead to intra-ethnic ties (Cf. Bouma-Doff, 2007), and the third militates against the finding of their study which revealed that Dutch and Western groups are much more prone to move out of problem neighbourhoods and more likely to transfer to 'white' neighbourhoods compared to non-Western groups. Apparently, the 'white flight'

phenomenon prominent in US neighborhoods as the black population increases (Bonilla-Silva & Embrick, 2007) exists in the Netherlands as well (Van Ham & Clark, 2009).

One of the main justifications given for gentrification is that social housing areas are a haven of crime and incivilities. In the following narratives, incivilities are defined and their causes and effects are elaborated.

2.2. Neighbourhood Incivilities

2.2.1. Definitions

Neighbourhood incivilities, together with crime, are one of the reasons pointed out to legitimize urban restructuring. A popular idea is that poor areas are often hotbeds of crime and unseemly behaviour. In scholarly work, incivilities are not often discussed and studied as the main subject. Oftentimes, these are debated alongside the bigger topic of crime. A seminal article in 1982 suggested that the presence of incivilities in a an area encourages the proliferation of more serious crimes, giving birth to the Broken Windows Theory (Wilson & Kelling, 1982). This has spawned studies which looked into the bridging effect of urban disorder on crime especially on child development and the impacts of stigmatization to the behaviour of residents(Leventhal & Brooks-Gunn, 2000; Sampson & Raudenbush, 2004; Van Wilsem, Wittebrood, & De Graaf, 2006).

What exactly are incivilities? There are no universal definitions but scholars usually point out to its characteristics as disorder shown by the presence of garbage on the streets, vandalism, abandoned cars, broken windows, lawns in disarray, and houses in various stages of disrepair (Brown, Perkins, & Brown, 2004; Sampson & Raudenbush, 1999).

Neighbourhood incivilities also go by different labels thereby making it difficult to pin down conceptually. Some call it 'neighbourhood disorder' (Miles, 2008; Ross & Mirowsky, 2009), others call it 'urban blight' (Carpenter & Ross, 2009; Collins & Shester, 2009; Wilbur, 2008), or 'neighbourhood problems' (Lane, 2009; Tobler, Komro, & Maldonado-Molina, 2009; Wells, Schafer, Varano, & Bynum, 2006).

However it is defined- whether according to its symptoms or effects- or labelled- whether urban blight, disorder, neighbourhood problems, or neighbourhood incivilities- this particular social malaise has been related to other several problems. In short, it is a problem that further causes other, often, more serious problems. The following sub-section looks at these concerns individually.

2.2.2. Effects

There are several negative effects attributed to neighbourhood incivilities. Among the more relevant ones are crime, property depreciation and the related flight of investment, and a negative effect on the quality of life. These are dealt individually below.

2.2.2.1. Crime

As mentioned in the introduction of neighbourhood incivilities, a primary concern is its purported exacerbating effect on crime. The study done by Wilson and Kelling (1982) laid down the foundations of this argument. The idea is that criminals are attracted by areas with 'broken windows', i.e. blighted or decaying neighbourhood areas, since it shows that residents do not care about what happens (Brown, et al., 2004).

Harcourt and Ludwig (2006) reviewed an earlier study, an oft-cited evidence promoting police heavy-handedness, while researching on the effects of a government policy on redistributing populations from slums to better residential areas. Results revealed that 'police getting tough' did not really cause the drop in

crimes but people's behaviour were altered with the improvement in housing quality and location. Another research which looked into the causes and effects of urban disorder showed that the level of social cohesion among neighbours predicted (dis)order but there was insignificant linkage with crime besides robbery (Sampson & Raudenbush, 1999) (cf. Gault & Silver, 2008 for a critique on the research).

In the Netherlands, an interesting study discovered that visual cues of disorderliness, even with the presence of prohibitive signs and laws, led people to behave in disorderly or anti-social manner. A set of real-life experiments were conducted in which behaviour under two conditions- a. the presence of disorderly cues; or b. absence of disorderly cues- was observed (Keizer, Lindenberg, & Steg, 2008). Results showed that people behaved badly with the presence of disorderly cues. However, Torgler (2010) criticized the study as hinging strongly on an assumption about people's awareness of disorder and was limited to petty disorderliness.

2.2.2.2. Property Depreciation and Economic Flight

Urban blight is also observed to cause the devaluation of property values (Ellen, 2007). These are comparable to the effects of leaving near airports (Dekkers & van der Straaten, 2009; Nelson, 2008), sex offenders (Linden, Rockoff, & Research, 2006), or waste transfer stations and landfills (Eshet, Baron, Shechter, & Ayalon, 2007; Hite, Chern, Hitzhusen, & Randall, 2001) wherein house prices appreciate with distance from the said phenomena.

Sampson and Raudenbush (1999) argue that poorly-maintained neighbourhood areas cause the flight of investment as businesses are not financially convinced to continue operating. In turn, real estate developers will not be encouraged to develop their property. Moreover, people of higher income usually move out exacerbating the problem (Harris, 1999). While more evidence emanate from the US, the phenomenon of 'white flight' and related 'socioeconomic flight' is also found in the Netherlands. It was discovered that as the composition of ethnic minorities increased in neighbourhoods, the greater was the propensity for the native Dutch to move out (Van Ham & Clark, 2009).

A related study found out that neighbourhoods where some individual residents invest in home improvements had higher appreciation levels. Using 10-year data from the American Housing Survey (1995-2004), Park (2008) found out that, compared to neighbourhoods which spend little on improvements, high spending neighbourhoods had an inflation-adjusted annual appreciation rate of 15% more.

2.2.2.3. Fear, Health and Quality of Life

Neighbourhood disorder is also pointed out as causing fear, negative health impacts and an overall lowering of the quality of life for its residents. A US study found out that from as early as birth, a 'neighbourhood effect' was found on infants born to mothers from socio-economically disjoint areas (Schempf, Strobino, & O'Campo, 2009). These babies weighed 300 grams less than their counterparts from 'best' neighbourhoods. Evidence from other countries like England (Dibben, Sigala, & Macfarlane, 2006) and the Netherlands (Agyemang, et al., 2009) have also been presented.

Growing up, children face health challenges in disorderly areas as perceptions of safety may affect their playtime leading to obesity (Carver, Timperio, & Crawford, 2008; Molnar, Gortmaker, Bull, & Buka, 2004; Oliver & Hayes, 2008). More importantly, cognitive, affective and behavioural development are slowed down as shown by performance in school, self-expression and risky behaviour (Gephart, 1997; Swisher, 2008).

Through adulthood, health and employment are negatively affected for those coming from poor and disorderly neighbourhoods (Agyemang, et al., 2007; Elliott & Sims, 2001; Musterd & Andersson, 2006). In a study on poor neighbourhoods in Australia, it was found out that poverty, unemployment, lack of space and privacy in state housing, and related substance abuse caused psychological and physical ailments to residents (Warr, Tacticos, Kelaher, & Klein, 2007). These are related to the findings of Kim (2010) who saw that disadvantages in neighbourhoods directly caused depression and indirectly through neighbourhood disorder.

Finally, studies on the health of the elderly show that their perceptions of neighbourhood quality strongly indicate individual physical health (Bowling, Barber, Morris, & Ebrahim, 2006) and that the physical environment affected the 'walkability' of elders (Nagel, Carlson, Bosworth, & Michael, 2008)

2.2.3. Causes

Since the study of neighborhood incivilities attracts a number of disciplines from the social sciences such as sociology, criminology, geography and psychology along with architecture and urban planning, there are a variety of theoretical explanations which either offer structural arguments maintaining that a wide range of macro-level factors cause people to behave in certain ways, pathological reasons which point to personal characteristics of people that are supposed to breed certain behaviour, a combination of structural and pathological factors, or the role of space and the design of buildings and road layout which either attract or discourage incivilities.

Lupton (as cited in Hastings, 2004) presents three groups of 'discourses' on neighbourhood decay. These are the '"pathological' discourse; a 'structural' discourse or a discourse which draws on the 'area effects' literature" (p. 235). The pathological explanation, a micro-level of analysis, says that the concentration of poor people, called the 'underclass' (Murray, 1990) or more lately in British context, the 'chav' (Hayward & Yar, 2006) breeds all kinds of problems. Particularly in the US, the decline of neighbourhoods having a majority of African-Americans was increasingly seen as not caused by racism but by the different culture and lifestyle of blacks (Wilson, 1980). Oscar Lewis, an American anthropologist, is credited as popularizing the so-called 'culture of poverty' (Lewis, 1963). He pointed out that the "shiftless, lazy, unambitious people" (p. 9) who are villainous, vicious, and delinquent- those who compose the 'culture of poverty'- are a threat to the American middle class.

Because of its overt ethnocentrism, the pathological explanation has reaped much criticism. According to Bonilla-Silva and Baiocchi (2007), the 'culture of poverty' thesis which has influenced much of academic research on ghettos downplays the role of racism and history and other factors such as unemployment and the national economy in explaining for the reviled behaviour of the 'underclass'.

The 'structural discourse' rejects that certain cultures or individual traits create ghettos and offers a wider perspective in trying to explain for neighbourhood disorder by looking into macro-level factors, such as the interplay of global, national and regional socio-political and economic forces. In the US for example, Wilson (as cited in Small & Newman, 2001, p. 24) argues that macro-economic shifts which included the transfer of industries from manufacturing to service led to an increase in ghettos. Massey and Denton (1987) posit that poor enforcement of housing policies did nothing to improve racial segregation which, coupled, with the speedy increase of poverty in urban centers, led to more neighbourhoods mired in poverty and disorder.

An alternative 'discourse' which combines micro and macro-level explanations is the 'area-effects'. According to Hastings (2004), this view is reflected in research which looks at the synthesis of macro-economic and social changes with the characteristics of people living in neighbourhoods. For example, the

increased globalization of trade and production have combined with the low level of skills of Afro-Americans (Spencer, 2000, p. 78) and working class Dutch and ethnic migrants (Engbersen, Schuyt, Timmer, & Van Waarden, 2006) worsening the condition of the neighborhoods where these people live in. This was the case for the city of Enschede wherein most of the workers of its backbone textile industry had low education or skills as the tasks were essentially manual. Global economic restructuring and their weak position in the labour market exacerbated their conditions (Engbersen, et al., 2006, pp. 63-64). Another case is the Dutch housing policy intended to create more heterogeneous neighbourhood populations. Instead of producing its desired outcome, it may do the reverse by concentrating poverty and ethnicity elsewhere as most of the social housing residents in the gentrified areas would not be able to afford owner-occupied units (Van Kempen & Priemus, 2002).

A fourth and emerging explanation is based upon the idea that space and the relationships of features in space can influence the behaviour of people or facilitate certain social phenomena in an area. In 'Defensible Space', Newman (1972) introduced the concept of urban design which seeks to prevent the growth of unseemly behaviour and crime. He proposed the idea of a semi-closed 'territorial space' characterized by physical barriers to deter criminals from invading and low-rise housing for block familiarity and high social cohesion. While this theory has been used repeatedly by scholars to study and understand crime (Reynald & Elffers, 2009; Rogers, 2007), it has also garnered various criticisms which question, among others, the intermediary role of social cohesion (Merry, 1981) and the mixed effects of different forms of space defence to crime (Perkins, Meeks, & Taylor, 1992).

Lastly, the so-called space syntax is a technique developed in the 1980s at the University College London by Bill Hillier and colleagues. This is based upon the idea of a decomposable space which can be analyzed by networks and shown as maps showing the different connections and integration of different parts of space (Hillier, 2007; Turner, 2007). On neighbourhoods, space syntax is mostly used for studies of robbery, urban pollution and traffic whereby pedestrian and vehicular flow are analyzed to show which areas are most vulnerable(Friedrich, Hillier, & Chiaradia, 2009; Haklay, Sahbaz, & Vaughan, 2008; López & Van Nes, 2007; Nubani & Wineman, 2005). In 2004, Ratti (2004) issued a critique on space syntax as relying solely on topology to the expense of geometry, and the exclusion of building heights and different land uses. According to Ratti, simplifying pedestrian movement to an axial map throws too much information that is relevant to people's choices in walking.

In summation, there are a variety of explanations for what causes neighbourhood incivilities. These range from micro or local factors such as perceived behaviour of certain people or cultures or their attributes such as level of education to macro-level reasons like economic globalization or racism. Other explanations point out inequalities created by space and the design of streets and buildings. Still, other versions combine these perspectives for a more comprehensive explanation of neighbourhood phenomena.

How to deal with incivilities and other daily issues in the city's neighbourhoods, including the quick response to citizen complaints or messages, is one of the main concerns of urban governance. Advanced telecommunications have enabled fast and real-time two-way communication between the public sector and its citizens. The succeeding paragraphs will elaborate on the use of the telephone, computer, and the internet towards the improved delivery of public services.

2.3. E-government

E-government is the use of information and communications technology in government. Because it is a huge concept with a wide variety of applications, it has a variety of meanings. Operationally, a definition suggests it as "utilizing the Internet and the world wide web for delivering government information and

services to citizens" (UN&ASPA, 2002, p. 1). Eid (2009, p. 528) presents its sub-types namely, government-to-government (G2G) communication and standardization of services, government-to-citizen (G2C) delivery of services and communication, government-to-business (G2C) towards facilitating commerce, and government-to-civil-society (G2CS) interaction for transparency and coordination.

In a review of related literature on e-government, Yildiz (2007) traces the evolution of the use of Information Technology (IT) in government. The first chapter starting from the early 1960s saw its role in improving bureaucratic transactions as Weberian ideals of efficient and effective government through bureaucracy were increasingly seen wanting. There was a need to push 'bounded rationality' further using technology with, for example, the automation of transactions. The second chapter which began in the 1980s saw technological innovations in computers resulting to their increased accessibility. This led to an increased decentralization of computer use and a greater role for IT beyond improving government transactions. In the 1990s, the third chapter was marked by two important events- the birth of the World Wide Web and various legislation and policies supporting increased use of IT in government such as the use of 'one-stop-shop' portals, sharing of information to the public online and exchange of data between different government agencies. Finally, the rise of terrorism especially with the events in September 2001 has seen more emphasis on data sharing within and between governments but caution over data falling into terrorists has resulted to the retreat of policies on government openness.

Proponents of e-government say that ICT promotes broader citizen participation in decision-making (Bouras, Katris, & Triantafillou, 2003; Garcia, Pomar, & Hoeschl, 2004), improves transparency of transactions (T. B. Andersen, 2009; Bertot, Jaeger, & Grimes, 2010; Maggipinto & Visconti, 2008) and enhances the delivery of public services (Chappelet, 2004; Torres, Pina, & Acerete, 2005). Jaeger (2005), however, warns that ICT is a double-edged sword which can either serve to enhance the quality of participation in public discourse or increase the polarization of society due to the design and presentation of government websites, intensity of government monitoring, disinterest of politicians to online opinion, and laws that limit the power of online opinion in legislation.

2.3.1. E-grievance

Martinez, Pfeffer, and van Dijk (2009) define e-grievance as "public feedback mechanisms" (p. 4) where there is a possibility to trace citizen-to-government correspondence. The *e* in e-grievance means complaints can be sent through the telephone, email, or via a pre-designed complaint system on the internet without the need to physically present oneself to the concerned government office. On the other line are a few front-desk workers who take the phone calls or internet-sent messages and course them to concerned offices. Ideally, a database is kept which stores relevant information such as the type of complaint, address, and name of the complainant if necessary. A status column may also show whether complaints have been satisfactorily addressed or not. The following figure is a basic structure of the e-grievance mechanism:

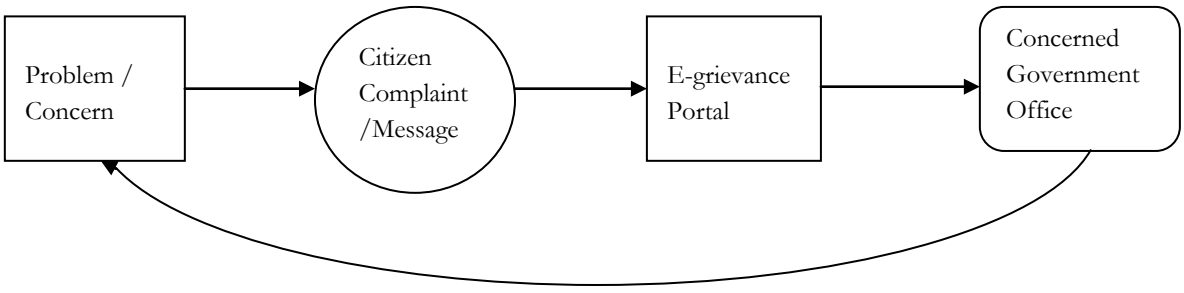

Figure 3. A basic schema of e-grievance mechanism.

Because it is a novel application, there is little scholarly work done in the field of e-grievance. The few exceptions are anecdotal, i.e. discussions of government accountability and public grievance mechanisms where it is mentioned in passing (Brewer, 2006; Mulgan, 2000; Ranganathan, 2008). So far, the only study which exclusively looked into an e-grievance mechanism was done in India (Martinez, et al., 2009). Researchers used GIS to map complaints on the living environment and compared the output to data on deprivation. Results showed a mismatch between the needs of the poorest sectors and where the complaints emanated from revealing that the medium for grievance is skewed in favor of the upper socio-economic strata even though more than 90% of complaints were delivered physically and only a small fraction sent via SMS and the internet. The research concluded that while there is a need for concomitant in-depth qualitative studies, the socio-economic and political weakness of deprived groups would preclude a shift of public services to where these are most needed. Verplanke, et al.(2010) review the aforementioned study, alongside a 'human sensor web' project in Zanzibar to elaborate on the growing role of citizens in directly influencing decision-makers as the mediating role of bureaucracy is increasingly challenged by web 2.0 applications and virtual globes like Google Earth. While a boon for democracy, danger lies with a publicly unaccountable market which defines how information is presented.

3. CONCEPTS & FRAMEWORK

3.1. Introduction

British sociologist Anthony Giddens introduced his Theory of Structuration (Giddens, 1984) to bridge the yawning gap between actor and systemic explanation of human behaviour. Prior to his theory, behaviour was either explained in terms of individual human actions (agency/actor theory) or by a series of formal and non-formal rules and systems that allowed for or restricted human behaviour (structural theory). Structuration theory holds that human behaviour is influenced, partly, by pre-existing socio-economic and political structures and partly, by individual choice. While freedom of choice exists, the options are limited by a person's wider environment. Additionally, human action either serves to perpetuate existing structures or tries to modify them.

3.2. Constraints & Opportunities

Drawing inspiration from Giddens' Theory of Structuration (Giddens, 1984), social scientists have come up with various theories to explain human behaviour, combining the effects of pre-existing societal conditions and the physical environment with individual choice. Behaviouralists and crime analysts, for this matter, moved on from the simplistic 'broken window' theory (Wilson & Kelling, 1982) which explains that crime exists because the opportunity is there to where society and the individual shape and re-shape each other.

3.2.1. *Structural Limits in a Neoliberal Context*

In the literature review, the general theme of urban governance and how it changed starting in the 1970s is discussed. It is explained how global socioeconomic and political changes have impacted on the way national governments managed sub-national territories such as regions and cities. Fordist and Keynesian ideals of redistributive policies and big government were replaced by neoliberal principles of global competitiveness and an increased roles for the private sector (Brenner, 2009). A related phenomena was the transfer of low-skill jobs to countries of cheaper labour and the shift from manufacturing to service industries. While these have positive effects on the few centers of global economy, peripheral cities and regions suffered.

Meanwhile, a government solution to the clustering of poverty in certain neighbourhoods has been the replacement of social rented housing with more expensive, owner-occupied units. This is resulting to 'social mixing' in certain areas while concentrating poverty in other city parts.

The foregoing is the backdrop for my conceptual framework- the structural/macro-level explanations for the continued poverty and general malaise in distressed neighbourhoods. In the succeeding paragraphs, micro-level conditions that interact with structural issues to cause problems in neighbourhoods are laid out.

3.2.2. *Micro-level Factors and the Social Cohesion Theory*

In a pathbreaking study, Wilson (1987) narrates the phenomenon of clustering of poverty, unemployment and race in certain parts of a neighbourhood which is also self-reinforcing. African-Americans who are born in crime-ridden and impoverished ghettos tend to grow up like their parents. Studies on adolescent behaviour show evidence that children growing up in poor neighbourhoods are more prone to risky behaviour such as delinquency and violence (Leventhal & Brooks-Gunn, 2000; Sampson, Morenoff, & Gannon-Rowley, 2002). These affirm that poverty debilitates the development of social control,

neighbourhood ties and mutual trust among others thereby causing the underdevelopment of proper social behaviour in children.

In a discussion of the effects of spatial concentration and segregation in neighbourhoods, Bolt, Burgers, and van Kempen (1998) admit that the clustering of "socially-deprived individuals and households" (p. 86) characterized by low income, unemployment and dependency to welfare in neighbourhoods creates deleterious sub-cultures and practices that exacerbates segregation. The study also refers to Engbersen and Snel (as cited in Bolt, et al., 1998, p. 86) who found out that 'survival strategies' like informal economic behaviour, crime, and nuisance are found in these areas due to a low level or the lack thereof of social cohesion. In Germany, Friedrichs & Blasius (2003) found evidence that poverty in neighbourhoods had a positive impact on deviant behaviour. Sampson, Morenoff, and Gannon-Rowley (2002) posit that there exists a plethora of evidence from studies which show the presence of "geographic 'hot spots' for crime and problem-related behaviours" (p. 446) found in areas with concentrations of multiple deprivations.

Economic deprivation nurtures conditions that encourage decay and degradation in a neighbourhood. Firstly, the urban poor would look for the cheapest housing available. In semi-welfare states like the Netherlands, the only possible legal option is the social housing. Clustered low income housing causes the flight of commercial investments as the residents will find it difficult to viably support them. As a result, investors of housing will be wont to improve their properties (Sampson & Raudenbush, 1999). On the household level, families will have stretched their budget on basic necessities that maintaining their housing unit will be seen as frivolous. Moreover, the disposal of garbage requires the payment of charges which can be also seen as an additional burden to an already cash-strapped family. Secondly, residential instability and high transience of people who have a weak position in the housing market discourages positive behaviour. It matters whether somebody rents a housing unit without a definite plan of staying there because of unstable source/s of income. Thirdly, low income housing are characteristically highly-dense rows of flats. Essentially, overcrowding breeds different kinds of problems.

Aside from directly causing decay, poverty- alongside ethnicity- also does something to the behaviour of people as a social group that magnifies its effects to the living environment. Studies point out to the role of social cohesion in keeping order in a neighbourhood (Kearns & Forrest, 2000; Sampson, et al., 2002; Sampson & Raudenbush, 1999; Van Bergeijk, Bolt, & Van Kempen, 2008; Van Marissing, Bolt, & Van Kempen, 2006). Kearns and Forrest (2000) break down the concept into five different dimensions: 1. Common values and civic culture; 2. Social networks and social capital; 3. Place attachment and identity; 4. Social order and control; and 5. Social solidarity and narrowing of income inequalities. While there is no universally-agreed definition of social cohesion, scholars agree that it influences behaviour within a neighbourhood.

To be socially cohesive means people have a shared view of things and plans for the future. Urban poverty hotspots within neighbourhoods usually share space with middle income areas and these two do not mix together- the lifestyle of middle income as compared to the poor is different. Include ethnicity and there is a very sharp divide. Social cohesion is low. There is "no mating without meeting" (Verbrugge as cited inVan Bergeijk, et al., 2008, p. 5) as socio-economic factors, housing tenure, and ethnicity tend to separate people in groups.

Lastly, neighbourhood problems- especially for incivilities- are usually affected by the constant visual presence of 'eyes on the street'. American journalist Jane Jacobs maintained that enclosed spaces and cul-de-sac neighbourhoods are actually risk prone to crime and incivilities (Jacobs, 1961). According to her, a guarded street is one where the streets and pathways are constantly used by pedestrians and where houses

are built as good vantage points from where signs of incivilities and crime can be observed. Houses with street-level doors are usually the best while tall apartments are the worst.

3.3. The Conceptual Framework

The interplay of wider structural socio-economic and political factors with micro-level attributes determine the state of neighbourhoods, whether these are hotspots of decay and incivilities or not. Macro-level socioeconomic and political forces dictate the extent in which cities and at their disaggregation at the neighbourhood and individual household levels can plan, behave and consume. Having considered this larger context or playing field, the next consideration is on the micro-level. These include the individual qualities of people like skills, education, and readiness to enter the job market that affect their economic standing. Also included here is the design of buildings and the layout of streets.

The retreat of the welfare state means that the urban poor face fewer options and fewer assistance from government. At the micro-level, households which have weak positions in the labour market are worse off. Here, ethnicity can predict income level as minority immigrants have either low education or skills training or find it hard to enter the labour and housing market. Thus, neighbourhoods with poverty hotspots and where there is a high number of ethnic minorities would be breeding areas for urban incivilities (Van Wilsem, et al., 2006). There are differences though between incivility types. For example, garbage dumping complaints are more apparent in residential areas while vandalism and other nuisance are found in 'open spaces' or where residential and commercial land use meet.

Issues of non-incivilities such as complaints on public greenery have a slightly different set of causal factors. However, income and ethnicity still plays major influences as these determine housing choice. Housing type and location would reveal what problems occur where. Greenery issues, for example, would be more pronounced in areas with thicker greenery such as neighbourhoods on city outskirts. The highest incomes are excluded- they have the strongest position in the housing market therefore generally will select the most comfortable dwellings with spacious lawns and located in areas having the least of problems.

4. METHODOLOGY

4.1. Area of Study

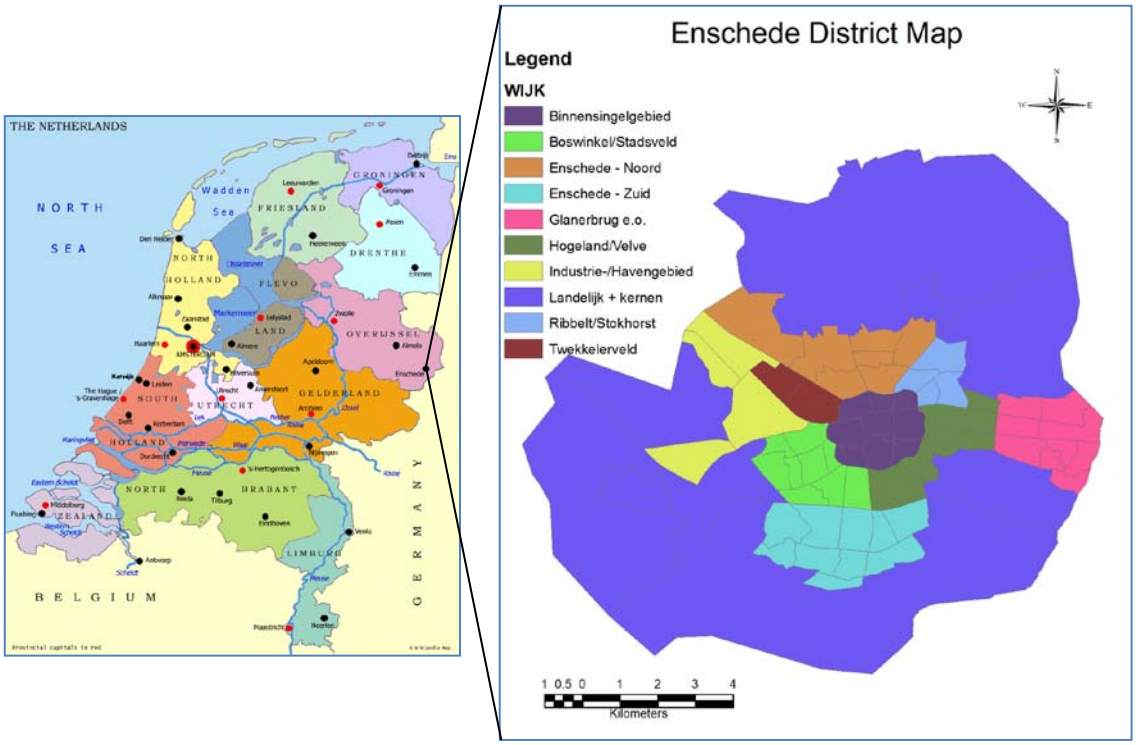

Figure 4: Map of the Netherlands on the left and a district map of Enschede on the right

The city of Enschede is located in the east of the country at the German border bounded by the city of Almelo on the North, Gelderland Province on the South and the municipality of Deventer on the West. It is a medium-sized municipality with a population of 157,076 since January 2010. Around 30% of residents are either born abroad or have one parent born abroad (I&OResearch, 2011).

Enschede started as an egg-shaped built-up area in the Old Marketplace in the 14th century. It was given city rights in 1325. Major developments occurred in the 18th-19th centuries because of the growth of textile and manufacturing industries. According to Yücesoy (2006, pp. 69-70), the city's spatial layout was a result of four different construction eras. The first period during the middle ages saw the building of the egg-shaped settlement in the city center. The second period occurred during the early 1900s. As Enschede was heavily bombed during WWII, there was a need for reconstruction marking the third period until 1970. The last period saw the extension of construction into suburban areas well unto the 1990s.

Prior to the 1970s, Enschede was noted for its booming textile industry and manufacturing sector. However, trade and investments liberalization favoured cheaper labor in the Far East which led to the demise of the textile industry. Combined with an increased mechanization of production, this saw a big slump in employment for the working class driving them to abject penury.

4.1.1. Socio-economic Brief (Source: I&OResearch, 2010)

Latest official figures reveal that Enschede has one of the lowest average disposable incomes in the country, only fifth from the bottom of the biggest 31 cities (G-31). It has an average disposable income of

€28.500 which is well behind the national average of €33.600. When standardized, the income is even lower compared to the other big cities. This shows an over-representation of low income groups.

Other figures reveal why Enschede lags behind in the income ranking. On employment, the city was 4th from the bottom with 60% working, 6.2% below the national average of 66.2%. Unemployment was a high 7.1% well above the national average of 4.5% and ranking 6th from the top. The number of jobs per 1000 of the working population was 722 compared to 733 for the national mean, again 8th from below.

With regards to the population percentage of the highly-educated, the city ranks 8th from the bottom with 18.1% compared to the national average of 24.9%. Moreover, 51.3% of the population had some form of assistance from the government compared to the national average of 28.5% ranking eighth from the top.

4.2. Data Collection

Three sets of data were required. First and foremost was the e-grievance data from the municipality. Second was neighborhood-level socio-economic data, specifically on income[1], average house price, ethnicity (Dutch, Other Western European, Non-Western), and population density. Third was a basemap of Enschede and required shapefiles to be able to analyze my data well.

4.2.1. Data Sources

E-grievance data was obtained from the Municipality of Enschede. The basemap and additional shapefiles, were accessed from ITC professors. Lastly, socio-economic data on neighbourhoods were downloaded from the websites of the Netherlands Central Bureau of Statistics (www.cbs.nl) and the municipality's *buurt* (neighborhood) monitor (http://enschede.buurtmonitor.nl/).

4.2.2. Data Description & Pre-processing

The three data sets needed preparation for analysis. Firstly, socio-economic figures for the individual neighbourhoods were organized in one table as these were drawn from different sources. Secondly, ArcGIS ArcInfo's *identity function* was used to give neighbourhood attributes to the streets. The identity function determines the geometric intersection of two sets of feature classes whereby an *input feature,* either a point, line or polygon*,* is projected into a polygon *identity feature* with the former getting attributes of the latter in the output. In the data, the basemap was the identity feature while the streets were the input features. Prior to this, there was a need to merge several disjoint segments belonging to individual streets as these were split into several segments. Thirdly, for the e-grievance data, a series of pre-processing steps had to be done. The data was more than 9 megabytes, a year's collection from July 2009-July 2010. It was arranged on an Excel spreadsheet with eight columns showing the status of complaints, district, neighbourhood and street where they come from, type and sub-type of complaint, medium of sending, and details of the complaint. All in all, there were 27, 029 records of complaints with 3 status categories, 7 mediums of sending, 5 districts, 69 neighbourhoods, 1, 855 streets, 15 types, and 79 sub-types.

The initial plan was to geocode the complaints according to specific house address and date. Although some of the records included house addresses in their details, majority had none therefore this choice was scrapped. Moreover, there was no classification by date so the time component was forgone. In the end, what was left was the street-level address being the most basic spatial level where data was available.

Monitoring the progress of complaints was not part of the research nor was complaints medium so these were excluded alongside districts since neighbourhood classification was a lower level of aggregation which can be directly associated to streets. Three types of complaints were removed because their

[1] Average annual disposable income- the total income of an individual minus insurance premiums and taxes

numbers were insignificant. Lastly, sub-types were eliminated since most of the remaining types were already quite small and sub-dividing them again would not be good for statistical analysis. In the end, what was left was a table with three columns- neighbourhood, street origin and type of complaint.

The remaining data needed further trimming to fit the study's aims. Out of the 69 neighbourhoods, ten were foremostly industrial areas. These do not fit the definition of living environment which are supposed to be in residential areas or those having substantial parts as residential. Moreover, most of them had no socio-economic data. Excluding these areas further slimmed the data to 59 neighbourhoods.

Complaints which had no type- simply labeled as *onbekend* (unknown)- were removed. Finally, there was a need to check and retype street names having typo errors to match with the spatial data. In the end, 1, 727 records were subtracted from the original table leaving 25, 302 records for the analyses.

4.3. Data Processing

To answer the research questions, a number of statistical operations were required. First, to reduce the number of complaint types and see which ones occur together, principal component analysis (PCA)was employed. Also, statistical explorations showed high correlations between explanatory variables so these were analyzed as well with PCA. Secondly, multiple linear regression was done to discover relationships between the principal components of complaints and socio-economic variables at neighbourhood level. Thirdly, spatial autocorrelation was conducted in ArcGIS to discover hotspots and their clustering. To determine probable causes for the latter, results were visualized with Google Earth and Streetview, ArcGIS overlay of shapefiles, and area visits.

4.3.1. Multivariate Statistics

Principal component analysis and multiple linear regression are both models of analysis under multivariate statistics which is concerned with finding out relationships between two or more statistical data. PCA seeks to reduce a set of correlated variables into a few uncorrelated principal factors while retaining as much as possible the original variance (Wood, Esbensen, & Geladi, 1987). Sometimes, using variables in statistical operations affects the results because they are already highly correlated with each other. The objective of PCA is to come up with a set of factors which are independent from each other for use in subsequent statistical tests. Meanwhile, multiple regression seeks to discover possible relationships between a set of independent variables and a dependent variable.

To discover relationships, if any, between the two sets of factors, PCA was first performed for each set after which the results were subsequently run through multiple linear regression.

4.3.2. Spatial Autocorrelation

Spatial autocorrelation statistics refers to a collection of methods which aims to measure and analyze the relationships between geographic phenomena or variables in space. Getis (2007, p. 492) says that it tries to answer two interesting questions, namely: 1. Does the spatial pattern imply something significant and worth exploring; and 2. Is it possible to gather information on the factors which may have caused the pattern by analyzing the output?

There are two general types of spatial autocorrelation statistics- global and local. The former seeks to get a single autocorrelation value for a whole data set, hence 'global'. The latter, on the other hand, intends to find spatial autocorrelation values in a data set at a spatially-disaggregated level.

The Getis-Ord Gi* (Ord & Getis, 1995) Hotspot Analysis, a local spatial autocorrelation statistics tool incorporated in ArcGIS, is very popular in the analysis of hotspots or spatial clustering especially in crime

mapping (Ratcliffe & McCullagh, 1999). For every feature in a dataset, the hotspot tool in ArcGIS determines the Getis-Ord Gi* statistic. This statistic is calculated by comparing the value of a feature and its surrounding neighbours with that of the whole data set. When the 'local sum' greatly varies from the mean, it yields a Z-score which is statistically significant (Mitchell, 2005). The Z-score is a test of statistical significance which, alongside the p-value, determines whether the null hypothesis (random occurrence) can be rejected or not. The farther it is from the mean, the greater the chance for rejecting the null hypothesis.

Prior to running the data in ArcGIS's Getis-Ord Gi* Hotspot Analysis, the complaints were standardized according to street length (total complaints per street per kilometre) to correct for artificial disparities in count. A confidence interval of 95% was used (alpha: .05). This means that the hotspots will be defined by statistically significant scores of 1.96 plus (1.96001) and above or + 1.96 standard deviations removed from the mean.

4.3.3. Visualization

Researchers on the neighbourhood environment are increasingly finding the efficiency and reliability of Google Streetview, a tool which allows for the virtual exploration of mostly urban areas at the street level. In a study aimed to determine its viability for inspecting the relationship of physical disorder and health, scholars compared two sets of observations (Streetview and physical audit) of 37 'block faces' on neighbourhood phenomena which included parking, physical disorder, sidewalk furnishing, and pedestrian safety. Results showed "high levels of concordance" (Rundle, Bader, Richards, Neckerman, & Teitler, 2011, p. 94) between the two especially on phenomena related to street infrastructure. Another study found similar results (Badland, Opit, Witten, Kearns, & Mavoa, 2010).

To visualize, ArcGIS's overlay function, Google Earth and Streetview, and area visits were used. The objects of visualization are not dispersed, individual hotspot streets but areas in which three or more hotspot streets have a marked proximity to each other when viewed on the Getis-Ord Gi* Hotspot output maps. These are referred to as *hotspot clusters*, a group of hotspots which cluster in an area.

Visualization is done per complaint type. As can be recalled, complaints are geocoded on the street level. The latter represents points where complaints or messages emanated from but the street as an object of study itself would give limited answers aside from its layout. Since theories on neighbourhood problems pinpoint several characteristics such as income and ethnicity as causal factors, it is necessary to look into the closest spatial representation of these variables which are adjacent to streets- house type and tenure, among other observable traits in space.

Firstly, in ArcGIS, the buildings and parcel shapefiles were overlaid on the hotspots map. Along with Google Streetview, this enabled a check on the type and tenure of houses adjacent to streets. The latter are proxies for income and ethnicity, the two main explanatory variables for neighbourhood incivilities. Generally, the low income live in rowhouses and flats though there are "large number of households" from the middle income (Van Ham, van Kempen, & van Weesep, 2006, p. 323). The common income progression according to housing type is detached, semi-detached, corner house, rowhouses and flats with detached representing highest income and social rented flats lowest. House tenure in rowhouses and flats makes a difference between lower middle income and lowest income as the latter may not even afford to own cheap units. Moreover, ethnicity plays a substantial role in housing composition. In a study on the relationship between Dutch housing policy shifts and housing conditions of different population groups, it was found out that controlling for income, age and household size, ethnicity was a strong predictor of residence in the social rented sector with immigrants at a higher prevailing rate than natives (Van Kempen, Schutjens, & Van Weesep, 2000). The researchers argue that this could be related to a weak position in the

labour market, late entry into the housing market, or discrimination by banks. Ten years later, this trend of segregation continues as low income households displaced by urban restructuring move in to areas of mostly social housing populated highly by non-Western ethnicities (G. Bolt & van Kempen, 2010). Secondly, zooming in with Google Earth at an eye altitude[2] of 1-4 kilometers enabled an analysis of street layout and other observable features. Lastly, hotspot clusters were visited, observed and photographed.

[2] The elevation of a user's viewpoint in Google Earth

5. CLUSTERS OF COMPLAINT HOTSPOTS

5.1. Principal Component Analysis

From an original of twelve complaint types, Principal Component Analysis (PCA) (Confidence Interval: 95%; KMO[3]: 0.784) reduced the list to six uncorrelated principal factors. The following table shows the percentage values of original complaint types that are preserved in the principal component factors. Types having similar values are merged to form a principal component factor.

Table 2: Rotated Component Matrix of complaint types

	Component					
	1	2	3	4	5	6
Veiligheidgevoel	**.887**	-.006	.096	-.246	.010	.033
Overlast/Vandalisme	**.871**	.108	.173	.247	.181	.157
Openbare Verlichting	**.824**	.019	.038	.405	.112	.165
Overige	**.801**	.039	.169	.335	.305	.220
Weginrichting	**.758**	.090	.291	.296	.328	.027
Wegen 'bibeko'	**.528**	.197	.484	.146	.219	.368
Speelgelegenheid	.050	**.930**	.055	.000	.155	.052
Groen	.048	**.906**	.069	.130	-.093	.155
Wegen 'bubeko'	.196	.072	**.903**	.230	.150	.174
Riool	.322	.155	.358	**.784**	.122	.013
Afval	.306	.048	.175	.100	**.902**	.119
Honden	.195	.183	.181	.017	.101	**.920**

Six complaint types are highly correlated and formed one principal component, labelled *Other*. These are Safety (*Veiligheidgevoel*), Nuisance and Vandalism (*Overlast/Vandalisme*), Streetlight *(Openbare Verlichting)*, Street Furnishing *(Weginrichting)*, Roads within built-up areas *(Wegen 'bubeko')*, and Others *(Overige)*. These are issues partly related to the behaviour of juveniles. Two types- Playground *(Speelgelegenheid)* and Greenery *(Groen)* are highly-correlated and form another principal factor. The rest- Dog *(Honden)*, Garbage *(Afval)*, Sewerage *(Riool)*, and Roads outside built-up areas (*Wegen 'bibeko'*)- remained as individual factors.

For the neighbourhood socio-economic variables, PCA (CI: 95%; KMO: 0.661) reduced the six factors to three. Table 3 reveals the percentage values of original factors captured in the new principal factors.

Table 3: Rotated Component Matrix socio-economic variables

	Component		
	1	2	3
Dutch	**.942**	-.209	.144
OtherWestern	**.857**	-.153	.405
AverageHouseValue	-.165	**.921**	-.168
AverageIncome	-.077	**.725**	-.588
PopDensity	.565	**-.709**	.124
NonWestern	.468	-.252	**.776**

[3] Kaiser-Meyer-Olkin measurement of sampling adequacy

PCA reveals a high correlation between Dutch ethnicity and Other Western ethnicities forming a single factor. This shows that Western European whites generally cluster together. Average House Value, Average Income and Population Density are also highly correlated though the last is related inversely to the first two. This reveals that house value can be a proxy for income and that affluence is negatively correlated with population density. From these three, the principal factor *Income* is created. Lastly, Non-Western ethnicity stands alone as a principal factor. This proves that, on the neighbourhood level, there is segregation between Western European whites and Non-Western immigrants.

5.2. Multiple Linear Regression

The principal factors from the PCA, specifically the 6 uncorrelated dependent variables (complaint types) and three uncorrelated independent variables (socio-economic measures) are regressed. Tables 4 and 5 show the results:

Table 4: Linear Regression (CI: 95%)

Variables	Western Europeans	In come	Non Wes-tern	Other	Greenery & play ground	Roads outside built-up areas	Sewer-age	Garbage	Dog
Western Europeans	**1.000**	0.002	-0.015	0.235	0.487	0.247	0.044	0.203	0.352
Income	0.002	**1.000**	0.002	-0.094	-0.120	-0.024	0.310	-0.132	-
Nonwestern	-0.015	0.002	**1.000**	-0.034	0.123	0.018	0.039	0.503	0.086
Other	0.235	-0.094	-0.034	**1.000**	0.006	-0.051	0.046	0.003	-
Greenery & p'ground	0.487	-0.120	0.123	0.006	**1.000**	0.009	-0.008	0.000	0.002
'Roads outside'	0.247	-0.024	0.018	-0.051	0.009	**1.000**	0.076	0.004	- 0.021
Sewer	0.044	0.310	0.039	0.046	-0.008	0.076	**1.000**	-0.004	0.019
Garbage	0.203	-0.132	0.503	0.003	0.000	0.004	-0.004	**1.000**	0.001
Dog	0.352	-0.297	0.086	-0.012	0.002	-0.021	0.019	0.001	**1.000**

Table 5: Linear Regression Correlation Coefficient (R^2)

Principal Component Factor	R2
1. All_others	.065
2. Green_playground	.269
3. Roads_outside built-up areas	.062
4. Sewerage	.099
5. Garbage	.315
6. Dog	.221

The linear regression coefficient (R^2) shows that the model explains roughly a third of the variance in the principal factor types of Greenery and Playground (.269), Garbage (.315), and Dog (.221). The rest are largely insignificant. Result shows that the variance in greenery and playground complaints is largely explained by Dutch and Other Western/Western European ethnicities (0.487) as compared to Non-Western (0.123). On the other hand, garbage is highly correlated with the 'other' ethnicity, Non-Western (0.503) compared to Western European ethnicities (0.203). Lastly, the factor dog is moderately correlated with Western European ethnicities (0.352). Income is significantly negatively correlated with the three dependent factors but at a weak level.

5.3. Spatial Autocorrelation and Visualization

5.3.1. Hotspots Maps

The following summarizes the spatial autocorrelation and visualization results[4] of types with significant statistical results starting with the hotspot maps[5].

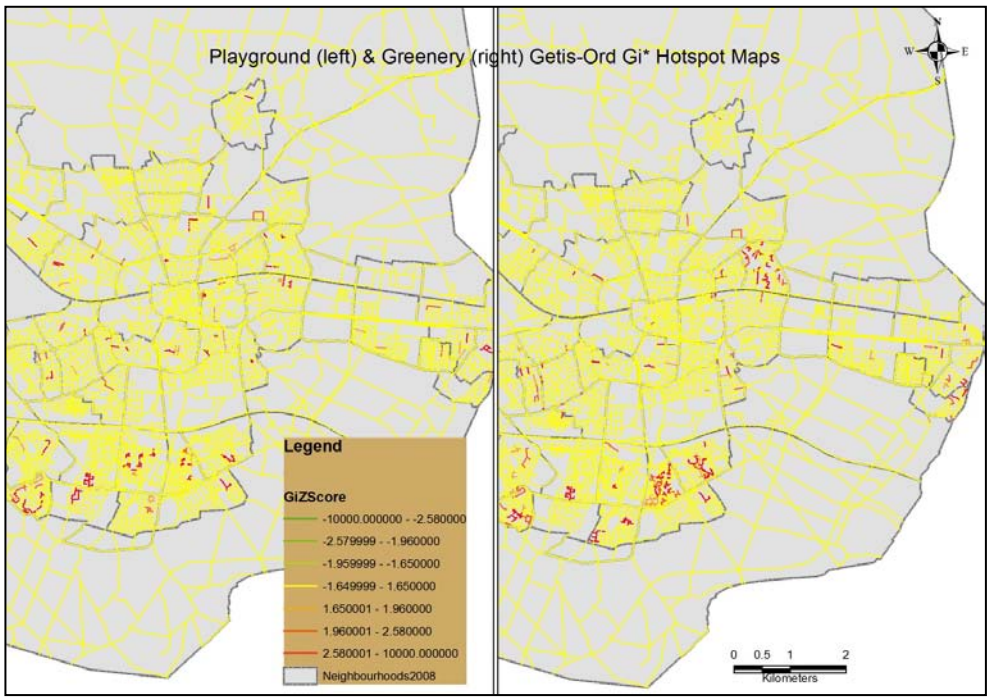

Figure 5: Hotspot Maps for Playground and Greenery

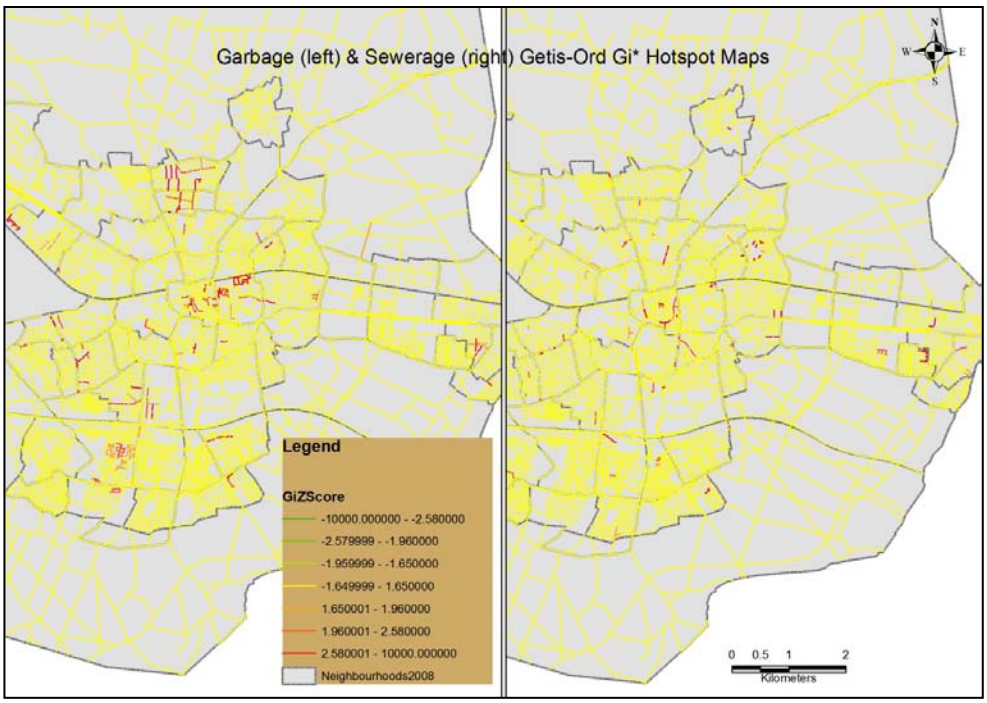

Figure 6: Hotspot Maps for Garbage and Sewerage

[4] The detailed visualization process is in the Appendix.
[5] Two maps are combined per paper to save space.

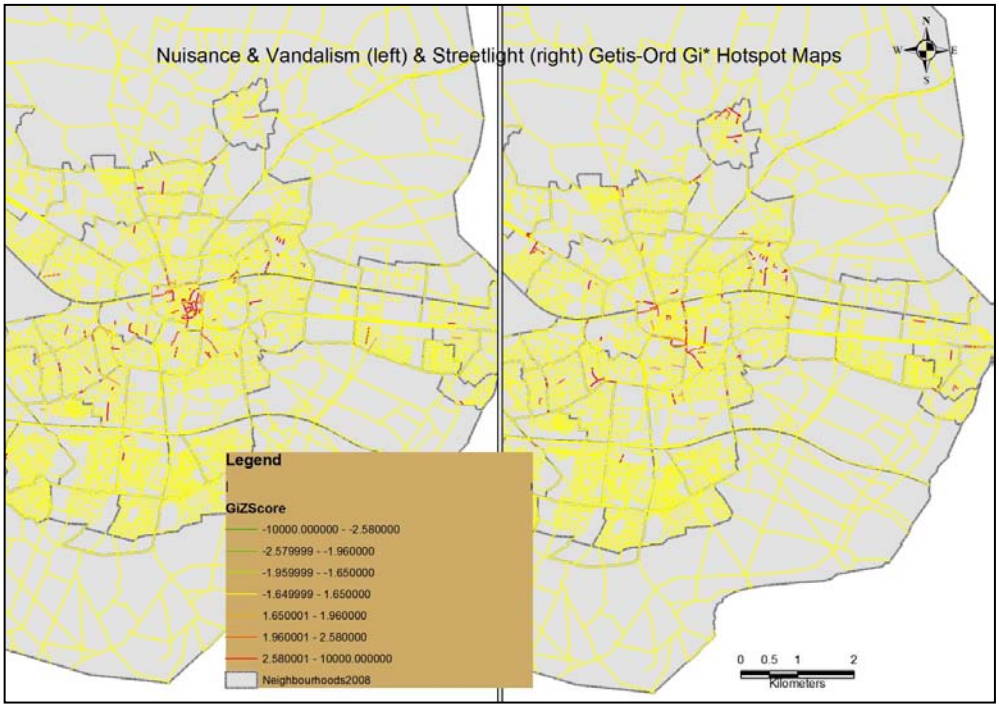

Figure 7: Hotspot Maps for Nuisance & Vandalism and Streetlight

5.3.2. Polygon Map of Hotspot Clusters

The following is a map showing hotspot clusters as polygons. It has seven polygons for garbage, nine for greenery, three for playground and two each for nuisance & vandalism, sewerage and streetlight.

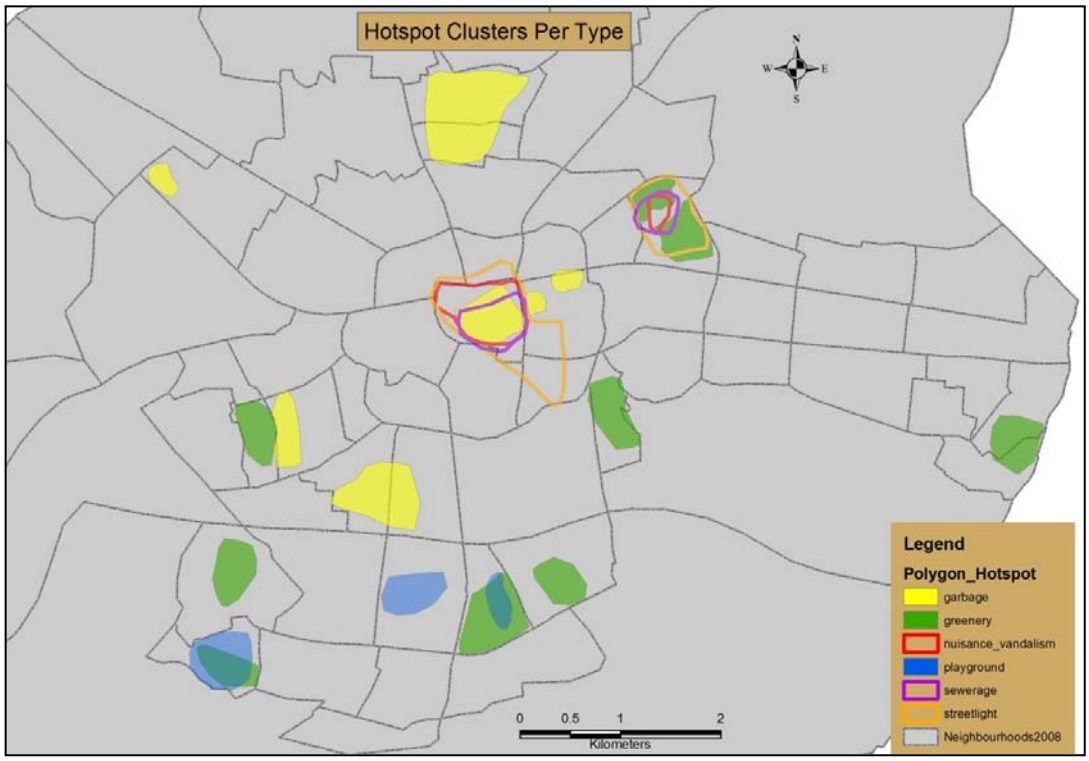

Figure 8: Map of Hotspot Clusters as Polygons

5.3.3. Greenery Messages

These are largely non-incivilities, distinguished from other complaints, constituting mostly of messages to the municipality with regards to the maintenance of public greenery in the living environment. There are eleven sub-types but most of them are related such as trees, leaves, roots, plants and weeds. Though complaints on untidy lawns are included, these are negligible compared to the majority of messages which refer to public greenery maintenance- a responsibility of the municipality.

Table 6: Sub-types of greenery messages and corresponding count

Sub-type (Dutch)	English	Count
Groenoverlast	'Invasion' of greenery on private space	1096
Bomen	Trees	864
Beplanting	Plants	857
Groenvoorziening	Landscaping	102
Onkruid verharding	Weeds growing on pavement	80
Gazon	Lawn	109
Blad overlast	Excess of leaves on the ground	241
Zwerfvuil/afval	Litter / waste	93
Wortelopdruk	Root pressure	340
Bloembakken	Flowerpots	23
Overige	Other	167
	Total	3972

There are nine greenery hotspots clusters. Specifically, these are located in Park Stokhorst in the Northeast with two clusters covering almost the entire neighbourhood, two clusters in Helmerhoek in the Southwest, a large cluster in Stroinkslanden Northwest in the Southeast covering almost the entire area and a cluster each in Stroinkslanden Northeast, Stadsveld South, Hogeland South, and Oikos-Schipolt near the German border.

5.3.3.1. Street Layout

The streets have irregular lay-out which do not follow a grid-like pattern of straight lines crossing each other. Grid layout of streets enables a controlled, if artificial, placement of greenery that does not intrude too much on the living environment. The neighbourhoods or micro-neighbourhoods where these clusters belong mostly have water courses or a lake nearby that support thick greenery.

The following are screenshots of hotspots and their surrounding areas from Google Earth at varying eye altitudes of 3-4 kilometers. Fig. 9 shows Park Stokhorst on the middle-right portion (encircled in red). Notice the wildly irregular layout of its streets as compared to 't Ribbelt on its west or Velve-Lindenhof on its south which are more grid-like. For the non-hotspot 't Stokhorst (northeast) which has also an irregular layout, the streets are fewer and houses are far more apart from each other. This is also the case for Stroinkslanden NW and NE (Fig. 10) and parts of Helmerhoek South and North (Fig. 11)- all encircled in red- which have irregular street layouts because of the presence of thick greenery usually along water courses. Surrounding neighbourhoods which have grid-like streets are non-hotspots.

Figure 10: Northeast- Park Stokhorst

Figure 9: Southeast- Stroinkslanden NW & NE

Fig. 11: Southwest- Helmerhoek

5.3.3.2. House Type and Tenure

An overlay of building and land parcel shapefiles over the greenery hotspot map, cross-checking with Google Streetview and area visits reveal that house types mostly range from terraced to semi-detached to a few detached houses. All of the housing units are individually-owned.

5.3.3.3. Greenery and Multiple Space-use

Streets located in residential areas that have less spare space are more likely to be hotspots. These are characterized by narrow free space with multiple use. Oftentimes, parking areas, lawns and mini-playgrounds compete for space with greenery.

The following are some pictures taken from greenery hotspot areas. They illustrate the multiple use of limited space which can cause some problems. Mini-neighbourhoods of mostly terraced and semi-detached houses are surrounded by greenery.

Figure 12: Some greenery hotspots

Clockwise from upper left: (1) Kruiseltlanden, Stroinkslanden Northwest; (2) Amelinkhorst, Park Stokhorst; (3) Vastertlanden, Stroinkslanden Northeast; (4) Ribbelthorst, Park Stokhorst

5.3.3.4. Area Visits

Visits and thorough inspections were conducted on greenery hotspot areas in Park Stokhorst in the North and Stroinkslanden in the South. Striking was the difference in greenery from these neighbourhoods as compared to the inner-city areas. The former were really like forest settlements. Near the city, the thickness and sizes of those trees are comparable only to those found in nature parks- the Volkspark, Ledeboer and Van Heek Park- and the area surrounding the University of Twente Campus.

5.3.3.5. Greenery Conclusion

Greenery messages emanate largely from clusters in the outskirts of the city- in the North, South and Eastern fringes where greenery is thickest. These areas are characterized by weaving and meandering street layout that blends with the natural environment. A government land use plan may dictate how developers behave where water bodies are found or where greenery is thicker or it may be cheaper to weave through nature. The houses- especially for semi-detached and detached- may have been designed for more upscale buyers who prefer greenery in the outskirts. These are precariously close to trees and shrubs which, because of weather and the organic nature of greenery may cause problems now and then for residents. This is especially true with areas of lower income- micro-neighbourhoods of terraced housing- where space is a luxury. Green but rich neighbourhoods like 't Stokhorst in the Northeast do not have this problem as they have wide lawns and backyards.

5.3.4. Playground

There are three sub-types of playground complaints. One is related to garbage on the playground area, another involves worn-out or destroyed playground equipment, while the last are problems with the playground area itself like a dirty sandbox, broken glass, dog manure, or destroyed playground fence.

Table 7: Sub-types of playground complaint and their count

Sub-type (Dutch)	English	Count
Zwerfvuil/afval	Garbage/litter	11
Speeltoestel	Playground equipment	159
Speelplek	Playground (general)	162
	Total	332

5.3.4.1. Street Layout

Like greenery, playground complaints cluster in residential areas where streets have either an irregular or cul-de-sac layout. This is a characteristic of highly-dense micro-neighborhoods in the South.

5.3.4.2. House Type and Tenure

Playground hotspot clusters are adjacent to mostly owned terraced or semi-detached housing in Stroinkslanden NW or Helmerhoek South or either rented or owned flat units in Wesselerbrink NW.

5.3.4.3. Playground Conclusion

Playground complaint hotspots cluster in Southern neighbourhoods where the buildings are typically laid-out in square-like mini-neighbourhoods. Essentially, these settlement units are small but densely-populated. While there is only one small playground with limited equipment, there are lots of children sharing. This is evidenced by the two major sub-types of playground complaints which either involve constant use of playground (e.g. frequently dirty sandbox) or playground equipment (wear and tear).

5.3.5. Garbage

There are seven hotspots clusters found across eight neighbourhoods. De Bothoven has two clusters while the rest- City center, Twekkelerveld, Deppenbroek-Mekkelholt, Stevenfenne, and a junction of Cromhoffsbleek and Boswinkel- have one cluster each. There are ten sub-types of garbage complaints. Forty-four percent (44%) of the complaints involve illegal dumping of garbage.

Table 8: Sub-types of garbage complaints and their count

Sub-type (Dutch)	English	Count
Illegale storting	Illegal dumping	2683
Grof afval	Bulky Waste	227
Grijscontainer	Grey wheelie bin	85
Zwerfvuil	Litter	403
Blokcontainer	Block Container	1477
Glasbak	Bottle bank	27
Ondergrondse container	Container tracking	257
Afval	Waste	782
Gevaarlijk afval	Hazardous waste	69
Groencontainer	Green wheelie bin	17
	Total	6027

5.3.5.1. Street Layout

Unlike greenery and playground complaints which cluster in streets with irregular and cul de sac layout, garbage complaints are independent of street layout as these are found in all street layout types.

5.3.5.2. House Type and Tenure

Garbage hotspot clusters are adjacent to social rented housing- low-rise flats (two to four floors) with nearby row housing which are not individually parcelled. This means that, primarily, this problem is correlated with low income and Non-Western ethnicities.

5.3.5.3. Space

While it was evident in greenery complaints that more space indicated lesser chance of being a hotspot, this is the reverse for garbage. As space between buildings increases, the greater the chances that the adjacent street is a hotspot. An exception are the housing units in the two hotspot clusters in De Bothoven on one side of the Hoge Bothofstraat. The apartments are medium-rise and there is little space in between- just a one-way road. However, area visits revealed that garbage are being dumped directly on the ground level near or under maze-like staircases. There is little chance of detection from the neighboring building as layout is asymmetrical and doors are not at the street level.

5.3.5.4. Area Visits

The major garbage hotspots- Deppenbroek in the North, Twekkelerveld in the West, De Bothoven near the City center, and Stevenfenne and Cromhoftsbleek-Boswinkel at the Stadsveld-Boswinkel area- were visited, inspected, and photographed. Two to four-storey, post-WWII social-rented flats looked like scenes removed from ghettos in the developing countries with garbage strewn carelessly and smell associated with decomposing matter. There seemed to be an air of both abandon and indifference.

5.3.5.5. Garbage Conclusion

To conclude, garbage hotspot clusters are found in low income areas characterized by social housing where there is ample space for dumping or one that provides a measure of cover from neighbors. Rented flats are generally the home of those with the lowest income and/or migrant Non-Western ethnicities. All kinds of litter from spoiled bread to plastic containers to paper are spread on shrubs fronting the flats, on sidewalks, on the open space of green grass, and the roadside. Moreover, the smell overwhelms. An explanation could be related to a lack of social cohesion as the variegated ethnicities within buildings preclude contact because of language and cultural barriers. Thus, there develops a general attitude of passivity and disorder. The following images show some garbage hotspot areas:

Figure 13: Some garbage hotspots

Clockwise from upper left: (1) Julianastraat, De Bothoven; (2) Beneluxlaan, Cromhoffsbleek; (3) Jekkerstraat, Deppenbroek; (4) Mercuriusstraat, Twekkelerveld

5.3.6. Other Complaints- Two Areas

The following are Google Earth images of the two hotspot areas from an eye altitude of about 1 km:

Figure 14: Other hotspot clusters- Park Stokhorst (left) & City center (right)

Vandalism & nuisance, streetlights and sewerage complaints cluster in the City center and adjacent areas and Park Stokhorst from across the railway track. The City center is unique in that it is a combination of commercial and residential areas and it is where houses of entertainment like coffeeshops and bars proliferate. Here, juveniles and addicts congregate at night and with the curvilinear shape of streets and the type of its residential buildings- middle to high rise flats- this makes detection of unruly behaviour as they happen (mostly at night) difficult. Meanwhile, the area in Park Stokhorst is a spot between residential and commercial areas. Incivilities theory says that juvenile delinquencies occur in such areas- where there is a mixture of land use or a meeting thereof because there is less visibility from homeowners. However, a question is that why only in this area- aside from the City center - when there are areas in other neighbourhoods with like meeting or mixture of land uses? This needs further investigation.

5.4. A Comparison of Spatial and A-spatial Statistical Results

This research embarked with the main objective of knowing whether complaint hotspots cluster, where, and why. This is divided into three sub-objectives. First is to see whether hotspot clustering occurs and which complaints cluster together. Spatial autocorrelation by Getis-Ord Gi* has revealed that some complaint types do exhibit hotspots clustering while PCA has shown that, at the neighborhood level, out of 12 original complaint types, six occur together, two happen in the same areas, while four have remained unique in space. Second is to determine the causal factors for the clustering of hotspots. With Google Earth and Streetview, ArcGIS overlay, and area visits, commonalities were found between hotspot clusters per type that set them apart from non-hotspot clusters. Third is to establish if neighbourhood multivariate analyses and spatial autocorrelation support each other or not. I answer this in the following paragraphs.

While PCA and multiple regression process data on the neighbourhood level and spatial autocorrelation and visualization does so at a more disaggregated, micro-neighbourhood level, results show that the two types of analyses generally echo each other's outputs.

Multiple linear regression shows that variance in some principal complaint types can be explained by some principal explanatory factors. Specifically, there are significant correlations between, on one hand, ethnicity and on the other hand, greenery[6], garbage and dog. In the spatial autocorrelation map results, the first two types have multiple hotspot clusters that, per complaint type, exhibit similar characteristics. For greenery, visualization shows that the hotspot clusters are characterized by thickness of greenery, irregularly-shaped streets, space limitations of house parcels and ownership of houses which are mostly terraced and semi-detached. Multiple regression shows that the principal explanatory factor Dutch & Other Western/Western European ethnicities is strongly correlated with this principal complaint type. On the other hand, visualization of garbage hotspot clusters reveals that these are marked by house type and tenure which are social rented flats. Multiple regression shows that for this principal complaint type, the Non-Western ethnicity comes out strongly correlated. For these two principal components- garbage and greenery- the multiple regression results and spatial autocorrelation maps support each other. The other principal component types have causal factors which are more dependent on place-specific variables or were scattered across space thus were not supported by the multivariate analysis.

Evidence from literature have already been presented showing that house type and tenure can be proxies for income and ethnicity. Generally, people with low income live in social rented housing. Moreover, these units have always been the haven of ethnic immigrants and the native Dutch do not comingle with ethnic minorities (G. Bolt & van Kempen, 2010; Van Ham, et al., 2006; Van Kempen, et al., 2000).

[6] The type playground is included here.

According to house type, garbage discriminates low-rise flats. For greenery, complaints happen across various house types, but primarily on terraced and semi-detached. This first indication shows that, spatially, garbage problems are already correlated with low income or/and Non-Western ethnicities while greenery messages come from more affluent lower middle income or middle income dwellings. With regards to tenure, garbage problems occur most often on social rented dwellings while greenery complaints cluster in owned houses. This second indication shows that garbage complaints are, indeed, problems of the lowest incomes and /or Non-Western ethnicities while greenery complaints are a constant concern for their richer counterparts of mostly Dutch and Other Western ethnicities.

For the two principal component factors that figure out in both spatial autocorrelation and multivariate analyses, ethnicity has accurately explained for the variance because it is measured exactly in census-accounted for as the total number of people according to ethnic group in relation to the total population of a neighbourhood. For income, the figure is an average, a smoothing out of different ranges of income in every neighbourhood so it was not able to figure out prominently in the regression results. While it is clear that garbage complaints occur in poorer areas than greenery problems, regression with income showed almost similar values (-0.132 and -0.120 respectively). The value for the latter should have been a larger positive number because greenery hotspot clusters are found in middle income neighbourhoods like Park Stokhorst, Stroinkslanden, and Helmerhoek while garbage problems are located in poorer areas like Deppenbroek, Twekkelerveld and De Bothoven. This did not turn out because, with the exception of wide farming areas and exclusively rich neighbourhoods like 't Stokhorst and Bolhaar, most of the neighbourhoods are a mixture of households with different income levels. Averaging incomes usually keeps differences to the minimum.

The other causal factors are issues of space and the concept of 'eyes on the street'. For the non-incivility messages on greenery, it is merely the very close spatial distance between houses and greenery, mostly trees which causes the problem. For the garbage complaints, there is a bigger issue on the availability of space for dumping trash and the nullification of the 'eyes on the street' with two or three-storey row houses that are not even symmetrically facing each other from across the street or open space, in the case of U or square building layouts.

Finally, there is an issue with regards to indiscriminate and irrational dumping even infront of the house which, for an outsider, would seem very undesirable and untidy. This is an issue which begs for deeper probing in qualitative studies. Would this be caused by the lack of social cohesion? Is it something defined by ethnicity? Or does it prove the culture of poverty espoused by Lewis?

6. CAUSES, SOLUTIONS, & WAYS FORWARD

Spatial autocorrelation has captured areas of hotspots for complaints and messages sent to Enschede's e-governance portal. Aided by visualization, it has shown that three types- garbage, playground and greenery- exhibit patterns of multiple hotspot clustering in certain areas characterized by certain attributes. Specifically, garbage problems cluster in social rented, low-rise flats peopled by the lowest of incomes and generally ethnic minorities. On the other hand, greenery messages gather in outer-city areas characterized by a thickness of public greenery and owned housing units correlated to lower middle income and middle income Dutch and Western Europeans. Playground complaints generally go with greenery but are limited to Southern neighbourhoods. A-spatial, multivariate analyses support these results.

The three leading clustering types are correlated to a combination of macro-level and micro-level factors. Each shall be discussed separately, along with other complaints, towards the arrival of a conclusion.

6.1. Garbage & Poverty

6.1.1. Neoliberalism & Poverty Solutions

Garbage complaints concentrate in social rented, low-rise flats/apartment buildings which were built after the war in the 1950s through the 1960s. According to Yücesoy (2006), these are part of a mix of housing types built according to "the principle of light, air, and green" (p. 74) with wholly or partly enclosed spaces forming mini-neighbourhoods themselves. Yücesoy (2006, p. 77) adds that in the 1970s, guest workers living in barracks near the factories where they worked started to replace more upwardly mobile Dutch residents as the latter opted for better dwellings in new housing areas in the south and north. Currently, residents are a melange of the weakest members of Enschede society belonging either to the working class who have been left out in the shift of industries from manufacturing to service and the flight of low-skill jobs abroad, unemployed youth, single mothers, the elderly, and ethnic minorities.

Following other Western European countries, the Netherlands is on the neoliberal track. The belief that the market is the optimal way for distribution of goods and services has negative ramifications to the urban poor. Firstly, privatization of public services and the continued diminishing of social welfare benefits narrow their options. Secondly, the replacement of social rented housing with more upscale units for the middle class is a war against the poor not on poverty. Fuelled by dubious arguments that a 'social mix' would bring about socio-economic change, it is resulting in the displacement of the poorest with their weak positions both in the labour and housing markets. Instead of minimizing poverty concentration and its purported ill-effects, this policy works on the reverse by concentrating poverty elsewhere. Attendant is the continued privatization of housing associations which are charged with managing state housing. This results to the scrapping of regulation for rents adding more burden to the poor.

Neoliberal policies may improve competitiveness vis-à-vis other cities as state resources are spent more on infrastructure rather than social services. However, these will not solve poverty and its impacts but exacerbate urban inequalities as the poor increasingly concentrate elsewhere. On the macro-economic level, what is needed is a sweeping paradigm shift which would look at the poor not as eyesores but challenges to be overcome- not by driving them away- by empowering them.

6.1.2. Ethnic Mixing & House Design on Social Cohesion

At the micro-level, site visits of garbage hotspot areas reveal that, while there is an over-all untidiness as shown by littering, most of the waste are concentrated in a few parts fronting certain house units. Within a micro-neighbourhood of 3 or 4 flats forming a U or square layout, only a few are being bad neighbours.

This should dispel the perception of a 'culture of poverty' in these areas. The bigger question is why these few people behave badly. One possible reason is the way social rented housing are built- flats of two or more floors. Essentially, dense housing promotes anonymity hence it is easier for a few people predisposed to deviancy to act accordingly. A related issue is the low level of social cohesion. A mixture of ethnicities who in the first place would not want to talk to each other creates an environment of anomie and indifference. Individual households may find a few friends next door or across the street but on the whole there is no thriving community which facilitates engagement between diverse ethnic groups. The low level or lack of cohesion makes it easier for social deviants to go about their incivilities without fear of being ostracized within the micro-neighbourhood as there is no community existing with a set of informal rules to punish them. Again, this assertion is based purely on a combined analysis of spatial and a-spatial statistical results. It would be interesting to test this hypothesis through qualitative research.

6.2. Playground & Space

Playground complaints are found in dense residential areas in the Southern outskirts. Each micro-neighbourhood unit is composed of three terraced buildings forming a U-shape or a mixture of terraced and semi-detached houses built in a way that a small space is reserved between buildings for greenery and children's recreation. The logic may be for children to have an immediate playing area near their houses.

Playground issues mostly involve wear and tear or an over-use of equipment or playing area. This can be explained both by the density of housing and the limited area and equipment.

Space is limited in these areas thus solutions exclude widening or additional equipment. Perhaps an answer is the development of bigger playgrounds or parks nearby. While there are, indeed, such playgrounds, these come near nowhere the size of those found near the city center. Another option is to schedule the check-up and maintenance of these mini-playgrounds more often than those which are not hotspots.

Again, while the solutions seem to be at the micro-level, there is a need for a macro-level shift to effect them. Neoliberal policies of privatization and low government spending on social welfare may preclude investment to these proposed solutions.

6.3. The Juvenile Delinquency & Addiction Cocktail

The complaint types streetlights, nuisance & vandalism and sewerage have hotspot clusters in the City center, surrounding areas and Park Stokhorst. Literature says that the first two types are found in areas of mixed land-use. This is the case of the City center and the area in Park Stokhorst where there is a convergence of space for residential and commercial purposes. The City center is undoubtedly a hotspot area because of its coffee shops, entertainment areas, and the curvilinear design of its streets amidst a mix of commercial and middle-rise apartments. Alcohol and marijuana are liberally served in these areas. However, there is a question on why Park Stokhorst is a haven for these complaints, while the others which also have areas with mixed land use are not. This could be an object of a future study. Moreover, there is a need to look at why sewerage problems discriminate these two areas and exclude others.

Micro-level solutions in the case of nuisance, vandalism and streetlights are undoubtedly related to street policing and increased vigilance. It could also include the strict regulation of coffee shops and disco houses which do not really contribute, from this research's point of view, to the positive development of youths. This would need value changes on the macro-level as entertainment areas are a boon for business attracting spending from the younger generation. There would have to be a balancing between, on one hand, narrow economic profits and, on the other hand, larger social priorities. Moreover, there needs a

shift from a liberal attitude on addiction- not towards police heavy-handedness- but to the introduction of firm disciplinary actions such as community work as penalties for addicts and juvenile delinquents.

Dutch society is becoming less tolerant towards coffee shops as its ill-effects are increasingly felt. In Enschede, more than half have been closed to only 9 operating since 2007. There is even a current proposal to ban shops that are within 350 meters from schools (RTVOost, 2011). While these are positive moves which can have direct impacts on decreasing juvenile delinquency and related behavior, a bigger issue which is being missed is alcohol addiction. If the government wants to improve the behaviour of youths, it should make serious steps to make it harder for them to access intoxicating liquor.

6.4. Greenery & Legroom

Messages related to greenery cluster in residential areas built upon the concept of *wooneenheden* or the mixing of middle and higher income housing of row, detached and semi-detached. These are found in the outskirt city neighbourhoods of Park Stokhorst, built in the 1970s, and in the Stroinkslanden and Helmerhoek which were built beginning in the 1980s (Yücesoy, 2006, p. 75).

These areas are characterized by a thickness of greenery especially large trees along roadsides and around houses. Environmentally-friendly at its best, pre-existing trees during the construction of the houses were well-preserved. While the air in the city center is not bad, environmental quality in these outskirt neighbourhoods is very good. There are a multitude of benefits that trees provide to people such as energy conservation in buildings, carbon and solar radiation capture, improvement of air quality, noise reduction, and reduction of run-off (Nowak & Dwyer, 2007, p. 26). On the neighbourhood level, studies point out to the physical health benefits of greenery as it encourages outdoor activity like walking as well as restoring mental health (Leslie & Cerin, 2008; Sugiyama, Leslie, Giles-Corti, & Owen, 2008; Willis & Crabtree, 2011). However, according to Nowak and Dwyer (2007, pp. 27, 39), trees can also present negative costs which include pollution from the use of machines in maintaining them, chemical and pollen emissions from trees, additional costs on building energy-use because of inappropriate placement of trees, water absorption, additional disposal costs, and the fixing of infrastructure ruined by trees.

The issue is whether residents feel stressed with regularly messaging the municipality about greenery maintenance that the manifold benefits gained are cancelled out. It should be far from the case but it is worthwhile to investigate, again, through qualitative research.

6.5. Summary

Apparently, different people have different problems. While the poorest in the city who are mostly ethnic immigrants face basic problems of liveability like health and sanitation every day, the lesser poor and the middle income are confronted with issues related to natural environmental phenomena. There is a bigger difference though. For residents in social housing, theirs is indeed a problem. For those living in terraced, semi-detached and detached houses in the greener outskirts of the city, it may be merely a small sacrifice with the multiple benefits from a green environment. When the latter send messages to the municipality, they are not complaining but merely asking the concerned public agency to come and do their duty.

Playground issues ail the lower middle class who can afford, at least, to own terraced houses but have to let their children constantly share common space with other kids. Nuisance and vandalism and streetlights issues are more related to juveniles and addicts who frequent entertainment centers at night. Residents in middle-rise flats in the City center and surroundings have to take care about these issues of fear and safety.

Some areas are relatively problem-free. These consist of neighbourhoods in the North- Bolhaar and 't Stokhorst, areas surrounding the City District (except for De Bothoven), and the big farming villages in the outskirts. These are generally populated by people richer than those living in complaint areas.

This situation reflects what Castells (1989) calls the 'dual city'. In post-industrial countries, economic restructuring, including the rise of the information age, have led to the reification of hi-tech industries and related jobs that, because of their characteristics, defy spatial constructs and are hugely different from the manufacturing industry. According to Castells (1989), this has given rise to cities having dual identities. On the one hand are the formerly working-class suburbs now peopled by the new 'knowledge-based' professionals, the new middle class, and on the other hand are ghettos, the worse public housing areas, populated by ethnic immigrants and the poorest who have lost their low-skill jobs.

6.6. Future Explorations

The e-grievance data was analyzed with spatial and a-spatial statistics enabling the discovery of hotspot clusters and their possible causes. However, a more perfect picture of causal factors can be revealed with a follow-up of qualitative research. Qualitative tools such as the survey, interview, focus group discussion, and immersion in certain neighborhoods will provide additional insights to the findings of this research.

On garbage, among the questions begging for deeper exploration is the issue of social cohesion in hotspot areas. Literature which argues that social cohesion mediates neighborhood quality is mostly based on perceptions. This research is different because it is based upon empirical ground data. It would be good to conduct qualitative research and compare the hotspot and non-hotspot areas and see if garbage areas have, indeed, lower social cohesion. Another is the effect of garbage to the overall health and well-being of residents. How serious are its impacts? Is the Municipal government, maybe, underestimating them because of imperfect information? On greenery, an interesting question is whether residents are bothered with regular maintenance or have gotten used to it. Finally, there is a need to investigate an area at the Park Stokhorst which, along with the City center, is a hotspot of juvenile delinquency and related incivilities.

6.7. Relevance of Spatial Information to Urban Governance

The previous sub-chapters detail the results of spatial analysis specifically the relationship of hotspot clusters with their probable causal factors. It has been explained that certain types of issues correlate with certain spatial characteristics, also supported by a-spatial analysis at a higher level of data aggregation. Accompanying this analysis are deeper insights on macro-level structures that influence and control socio-economic and political behaviour.

Although not a comprehensive study of complaints and messages sent to an e-grievance system, this exercise shows the possibility of using spatially-referenced data towards the exploration of societal problems and issues facing urban governments. The output is called spatial information. As information with a strong spatial emphasis, it is complementary to results of traditional a-spatial statistical methods and qualitative research.

While e-grievance is generally reactive, i.e. not different from traditional grievance mechanisms whereby the reporting of complaints, in principle, results to government action, the storage and classification of large amount of data which can be processed in GIS applications enables more creative ways for improving governance. Hotspots testing, for example, can provide a powerful analysis and visualization of complaints where they most occur. As previously shown, the identification of essentially problem areas or areas where messages cluster can lead to an exploration of probable causal factors for which possible solutions can be offered.

E-grievance is just one of the many data sources from within government and outside that can be spatially-referenced and analyzed to reveal trends and patterns while hotspots mapping is just one of the multitude of functions available in GIS. Data, as long as properly collected and stored, can be mined and analyzed in any of the tools GIS offers depending on the purpose of the study.

7. CONCLUSION

E-grievance mechanism is part of the growing application of advanced telecommunications in government, the so-called e-government. It involves the virtual and systematised transmission of grievances to a front desk which courses them to concerned offices. A database system keeps records of these messages and complaints, oftentimes tracking their progress.

The objective of this study was to determine the occurrence, if any, of hotspots of complaints and their clustering, where, and why, using Enschede city's e-grievance data. The Getis-Ord Gi* Hotspots Analysis, an ArcGIS spatial statistics application, was employed to map data according to type. Multivariate analysis, namely principal component analysis and multiple regression, was performed on related neighbourhood-level socio-economic data.

Output maps revealed the presence of hotspots, however clustering was limited to a few types of grievances and messages. Visualization showed probable causal factors which were present in hotspot clusters while multivariate analysis supported the results of spatial analysis in two principal grievance types. Indiscriminate dumping of garbage ails areas of social rented housing belonging to low income and minority ethnic groups while greenery issues cluster in the greenest city outskirts peopled by lower middle to middle income Dutch and other Western Europeans. The richest areas in the North, farming villages in the outskirts, and other neighbourhoods surrounding the City center are largely free from these problems.

Apart from greenery messages, which are mostly notices to the municipal authorities about the trimming of greenery excesses, most of the complaint types can be categorized as incivilities. Complaints on garbage, playground, nuisance & vandalism, and streetlights belong to this group. The last three are primarily related to juvenile delinquency and addiction while the first two are a product of macro-scale, socio-economic and political milieu and micro-level causal factors. Literature showed that the current neoliberal hegemony shaped policies which are inimical to the interests of the weakest sectors of society. A focus towards growth and investment and away from equitable distribution of wealth results to a yawning divide between the rich and urban poor creating situations at the neighbourhood level where poverty and ethnic heterogeneity mix in low-cost and, oftentimes, low quality state housing. The poor have a degree of segregation from wealthier citizens who congregate elsewhere. It is in the micro-neighbourhood areas of the former where these incivilities thrive.

Future qualitative research endeavours are recommended to have deeper insights into the causal factors of incivilities and their real effects on people. While spatial and a-spatial analysis have uncovered hotspot areas and probable causes, further probing with qualitative tools will provide a more complete picture of the issues and problems confronting the people living there.

This exercise suggests that the output of spatial analysis- spatial information- can enhance urban governance as it contributes to a more comprehensive understanding of socio-economic and political phenomena. The idea is that urban phenomena can be identified at pinpoint locations enabling target-based solutions. This complements other tools of information gathering and makes decision and policy-making much more informed. A-spatial statistics makes use of data usually at the higher level of aggregation which levels out differences 'on the ground'. Moreover, applications such as hotspots testing and their visualization are exclusive to spatial autocorrelation statistics.

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9. APPENDIXES

9.1. Visualization

9.1.1. Greenery Hotspot Clusters

There are nine greenery hotspots clusters. Specifically, these are located in Park Stokhorst in the Northeast with two clusters covering almost the entire neighbourhood, in the Southeast- two clusters in Stroinkslanden Northwest again having almost having the entire neighbourhood and a cluster each in Stroinkslanden Northeast, Helmerhoek South and North in the Southwest, Stadsveld South, and Oikos-Schipolt near the German border.

The following are selected greenery hotspot clusters at zoom level to show house type and tenure.

Figure 15: First set of greenery hotspot clusters

Figure 16: Second set of greenery hotspot clusters

9.1.1.1. First set- Clusters in Stroinkslanden NE, Stroinkslanden NW, & Helmerhoek South

9.1.1.1.1. Stroinkslanden NW 1 (Upper)

Seven hotspot streets lead to individual rectangular-shaped arrangement of two-storey row house buildings that face each other with a space for greenery on the center. Three of these blocks have miniature playgrounds in their centers. Trees are noticeably emplaced in the center space and on the back edges of the rectangle. There are also attempts of lawn gardening and beautification for some building fronts. Parcel layout shows that all the housing units are individually-owned.

9.1.1.1.1. Stroinkslanden NW 2 (Lower)

Seven hotspot streets snake through housing of mostly row and some semi-detached buildings that are more densely packed than the above neighboring hotspot cluster. Each unit of the terraced houses have rectangular-shaped garage or storage rooms that poke out of the main buildings perpendicular to the street. On the end of each of these rooms is a tree. Moreover, aside from lawns that seem to occupy more space than the street, striking are islands of greenery (trees and shrubs) on the street, fronting the houses. There seems to be an excessive emphasis on mixing greenery with people's living space. At the same time, miniature playgrounds are squeezed in whatever little space left on or near the centers of these blocks. All housing units are individually-owned as shown by parcel layout.

9.1.1.1.1. Stroinkslanden NE

Six hotspot streets hug through densely-packed row housing. Like the above greenery hotspots (1.2), the area is characterized by a visible merging of greenery and people's living space (or intrusion thereof) as islands of greenery narrow the street and each housing unit has at least one tree in front of its storage room which juts on the street. Miniature playgrounds are built in small spaces found in each of the blocks with trees overshadowing them. All of the housing units are individually-owned.

9.1.1.1.2. Helmerhoek South

Three long hotspot streets near a canal meander through a mixture of individually-owned detached, semi-detached, and terraced housing units. While the houses are not so densely-packed as in 1.2 and 1.3 above, the streets are still laid-out with islands of greenery and trees fronting almost every house. The mini playgrounds are bigger than those in the previous neighbourhoods but are surrounded by trees.

9.1.1.2. Second set- Clusters in Park Stokhorst, Helmerhoek North, and Oikos-Schipolt

9.1.1.2.1. Park Stokhorst (Northern Part)

Nine hotspot streets traverse a combination of semi-detached, row houses, and some detached houses in which the units are individually owned as shown by the parcel overlay. Some of the row houses have the same characteristics as those in Stroinkslanden NW and NE- the jutting storage or parking garage infront of the houses. Greenery is also abundant with tree 'islands' on the streets. Small playgrounds are also built in some vacant spaces.

9.1.1.2.1. Park Stokhorst 2 (Southern Part)

Five hotspot streets follow a curvilinear arrangement of row and semi-detached houses in which the units are individually-owned. As with 5.1 above, greenery is abundant with the proliferation of tree 'islands' in the middle or side of streets. Small playgrounds are also overshadowed by trees.

9.1.1.2.1. Helmerhoek North

Three hotspot streets cross housing areas of terraced, semi-detached and detached which are individually-owned.

9.1.1.2.2. Oikos-Schipolt

Seven hotspot streets converge along the boundary of neighbourhoods Schipolt and Oikos. Houses are a combination of semi-detached and detached units. The following table summarizes the observations for the hotspot clusters:

Table 9: Greenery Hotspot Clusters

Neighbourhood	No. of Hotspot Clusters	No. of Streets	Street Description (Google Earth and Streetview)	Housing Type (Building Shapefile Overlay and Google Streetview)	Parcel Division (Parcel Shapefile Overlay)	Other Observations
1. Stroinkslanden NW	2	14	1. Streets are irregularly-shaped weaving through greenery	Mostly row with some semi-detached	Buildings are divided by individual housing unit	1. 'Islands' of greenery; 2. Storage/garage rooms infront; 3. Small playgrounds overshadowed by trees
2. Stroinkslanden NE	1	6	Streets are irregularly-shaped weaving through greenery	Row housing	-do-	-do-
3. Park Stokhorst	2	14	-do-	Mix of detached, semi-detached and row	-do-	-do-
4. Helmerhoek South	1	3	-do-	-do-	-do-	-do-
5. Helmerhoek North	1	3	-do-	-do-	-do-	-do-
6. Oikos-Schipolt	1	7	-do-	-do-	-do-	-do-

9.1.1.3. Area Visits

Visiting the greenery hotspot areas provided me with a fresher and more direct perspective. I walked through the neighbourhoods of Park Stokhorst in the North and Stroinkslanden in the South. What struck me most was the difference in greenery from these neighbourhoods as compared to the inner-city areas. Near the city, I could only find such thickness, size and height of trees in parks- the Volkspark, Ledeboer and Van Heek Park- and at the University. But in these neighbourhoods, it was really akin to living in the forest.

9.1.2. Garbage Hotspot Clusters

Garbage type is one of the four variables that remained as single factors after undergoing principal component analysis (PCA). There are seven hotspots clusters found in seven neighbourhoods. In contrast to greenery and playground complaints which have two neighbors as whole hotspot areas, garbage hotspot clusters are more localized or are in a micro-neighbourhood level. De Bothoven has two clusters while the rest- City center, Twekkelerveld, Deppenbroek-Mekkelholt, Stevenfenne, and a junction of Cromhoffsbleek and Boswinkel- have one cluster each. The following are selected greenery hotspot clusters at zoom level to show house type and tenure:

Figure 17: First set of garbage hotspot clusters

Figure 18: Second set of garbage hotspot clusters

9.1.2.1. First set- Clusters in Deppenbroek-Mekkelholt , De Bothoven, Stevenfenne, & Cromhoffsbleek-Boswinkel

9.1.2.1.1. Deppenbroek 1 (Upper)

Four hotspot streets bisect two-storey row-type houses and low-rise flats (three floors). The buildings are built such as that on the West side of the street are three pairs of row houses parallel to the street while on the East part of the streets are three sets of flats perpendicular to the street. Between the flats are empty spaces of trimmed grass. An overlay of parcels show that there is a high tenancy rate (86.78%) as only 23 (13.22%) of the 174 (29 rows X 6 houses/units per row) house units are individually-owned.

9.1.2.1.1. Deppenbroek 2 (Lower)

Similar to Deppenbroek 1 above but with differences with regards to the presence of newly-built terraced and semi-detached housing for the lower middle class (probably part of the urban renewal program, i.e. "gentrification") on the Southern entrance of the streets. Save for the new houses, the rest are two-storey row-type houses and low-rise flats (two floors) that follow the same configuration as above. Tenancy is 100% as shown by the parcel overlay.

9.1.2.1.1. De Bothoven 1 (Upper)

Five hotspot streets snake through this block of densely-built, three-storey row houses. The 32 buildings which have either four or five individual 2-storey units in them form 8 square-like shapes with a little greenery or space (for parking) in the middle. Between these building 'squares' are one-way car lanes (also used for parking) and sometimes pedestrian sidewalks on either side acting as buffer. A collector street hugs the whole area and links it to an arterial street on the South end of the block (colored yellow). Tenancy is 100% as each building has one sole owner. Noticeable in all of the squares are fences that seal the entrances of some buildings.

9.1.2.1.1. De Bothoven 2 (Lower)

Three hotspot streets follow an irregular arrangement of two-storey row houses in the middle part of the block. On its Western and Northernmost edges are low middle income housing probably part of an urban renewal program as shown by the newness of the houses. While the latter are individually-owned, all of the row houses which are either in one straight or a u-shaped building are not as shown by the non-partition of building parcels.

9.1.2.1.1. Mekkelholt

Three hotspot street enclose two blocks of a combination of two-storey row houses, low and medium-rise flats, and semi-detached houses. The outer buildings are row houses and flats which are mostly rented, as parcel overlay shows, while the houses in the inner part of the blocks are mostly individually-owned including some semi-detached houses.

9.1.2.1.1. Stevenfenne

Three hotspot streets meet in an area of low-rise three-floor rented flats.

9.1.2.1.1. Cromhofsbleek-Boswinkel

Two local hotspot streets traverse blocks of mostly low-rise flats with some row housing units. The buildings in a block (4 or 5) belong to single parcels. These are either parallel or perpendicular to the streets. Nearby, a collector street passes through terraced and semi-detached housing.

9.1.2.2. Second set- Clusters in the City center and Twekkelerveld

9.1.2.2.1. City center

Parts of the City center are also garbage hotspots. Its West side has six streets as hotspots and East side three streets. These are the areas where commercial and residential buildings mix. Most of the housing units are middle to high-rise flats.

9.1.2.2.2. Twekkelerveld

Six local streets hug residential buildings with half-square shapes. The houses are flats and are under one parcel. The center spaces are big but the place seems desolate with only a few cars. The following table summarizes the observations for the hotspot clusters:

Table 10: Garbage Hotspot Clusters

Neighbourhood	No. of Hotspot Clusters	No. of Streets	Street Layout (Google Earth and Streetview)	Housing Type (Building Shapefile Overlay and Google Streetview)	Parcel Division (Parcel Shapefile Overlay)	Other Observations
1. Deppenbroek	2	6	Grid-like	Low income housing- Two-storey row and Low-rise flats. Some "gentrification" for lower middle income	Most buildings in one parcel except for gentrified	Stark contrasts between old, row and flat housing and new urban renewal housing
2. De Bothoven	2	8	Irregular	Low income housing- Two to three-storey row-flats. Some "gentrification" for lower middle income	-do-	Gating/Fencing of front lawns in some buildings
3. Mekkelholt	1	3	Grid-like	Low income and lower middle income housing- row, low to midlle-rise flats, some detached buildings	Housing units on outer-area buildings are rented while those in inner-area buildings are individually-owned	
4. Twekkelerveld	1	6	Follows U-shape layout of buildings	Low income housing- two-storey row houses and low-rise flats	Row houses individually owned while flats are rented	Wide space fronting buildings but place seems desolate
5. Cromhoffsblee k-Boswinkel	1	3	Grid-like	-do-	All housing units are rented	
6. City	2	9	Follows curvilinear pattern of buildings	Commercial area with residential units of mostly row or flat housing	Combination of owned and rented housing units	
7. Stevenfenne	1	3	Grid-like	Low income housing- two-storey row houses and low-rise flats	All housing units are rented	

9.1.2.3. Area Visits

I visited almost all the major garbage hotspots- Deppenbroek in the North, Twekkelerveld in the West, De Bothoven near the City center, and Stevenfenne and Cromhoftsbleek-Boswinkel at the Stadsveld-Boswinkel area and took photographs of them. I was a bit shocked by what I saw. Social-rented housing (two-four storey post-WWII flats) looked like scenes removed from ghettos in the developing countries with garbage strewn carelessly and smell associated with decomposing matter. There seemed to be an air of both abandon and indifference.

9.1.3. Playground Hotspot Clusters

There are three hotspot clusters for playground complaints. All of them are in the South. The neighbourhoods of Helmerhoek South, Stroinkslanden NW and Wesselerbrink NE have one each.

Figure 19: Playground hotspot clusters

9.1.3.1. Stroinkslanden Northwest

Four hotspot streets of cul-de-sac layout lead to mini-neighbourhoods of terraced housing which are individually-parcelled. Greenery is apparent in the center spaces, alongside mini-playground.

9.1.3.2. Wesselerbrink Northeast

Five hotspot streets of cul-de-sac layout lead to mini-neighbourhoods of terraced housing which are either rented or owned. Greenery is apparent in the center spaces, alongside mini-playground.

9.1.3.3. Helmerhoek South

Six hotspot streets of irregular layout lead to areas of mixed housing, majority of which are owned. Greenery is apparent in the center spaces, alongside mini-playground. The following table sums up the characteristics of the hotspot clusters:

Table 11: Summary of Playground Hotspots

Neighbourhood	No. of Hotspot Clusters	No. of Streets	Street Layout (Google Earth)	Housing Type (Building Shapefile Overlay and Google Streetview)	Parcel Division (Parcel Shapefile Overlay)	Other Observations
1. Stroinkslanden NW	1	4	Cul-de-sac	Rowhouses	Housing units individually-parceled	Greenery in playgrounds
2. Wesselerbrink NE	1	5	-do-	Flats	Mix of rented and owned flat units	-do-
3. Helmerhoek South	2	3	Irregular	Row and semi-detached	Combination of owned semi-detached and terraced units and rented terraced units	-do-

9.2. Socio-economic Attributes & Complaints per Neighbourhood

Neighborhood	Average Income	Average House Value	Native Dutch Pop'n.	Other Western Pop'n.	Non Western Pop'n.	Pop'n. Density	Groen	Overige	Riool	Wegen bubeko	Wegin-richting	Overlast/ Vandalisme	Openbare Verlichting	Veiligheid gevoel	Afval	Honden	Wegen bibeko	Speelge-legenheid
00 City	15000	127000	1905	245	493	4716	49	122	90	38	210	115	508	12	348	11	56	3
01 Lasonder/ 't Zeggelt	18700	177000	1005	94	195	4337	21	17	18	29	37	10	58	1	37	1	16	3
02 Laares	14500	144000	1185	135	302	5082	30	26	15	22	46	18	32	0	58	4	15	4
03 De Bothoven	15600	145000	4173	493	1182	8842	56	53	29	34	104	28	87	6	453	18	16	9
04 Hogeland Noord	14500	133000	1912	201	692	7571	22	37	36	27	52	25	74	1	85	11	17	8
05 't Getfert	15900	153000	2609	316	1263	6679	58	50	32	53	82	36	59	7	147	18	29	6
06 Veldkamp, Getfert-West	13900	127000	1304	173	406	5037	27	20	26	14	37	18	14	2	48	10	16	11
07 Horstlanden /Stadsweide	16900	172000	1883	214	590	3683	50	25	26	18	78	30	46	7	85	11	16	3
08 Boddenkamp	17400	164000	366	49	92	1058	16	19	13	16	34	11	21	2	31	0	7	0
10 Velve/ Lindenhof	15200	138000	3006	316	900	6113	71	49	50	65	84	29	126	1	212	5	50	8
11 Wooldrik	20500	273000	1034	86	105	2203	37	20	29	25	16	5	23	3	26	8	13	1
12 Hogeland-Zuid	17400	182000	2082	165	140	6282	77	17	22	29	20	6	43	3	36	7	17	4
13 Varvik/ Diekman	16100	158000	2667	244	634	2156	100	42	48	44	43	18	186	3	101	40	39	0
20 Cromhoffsbleek/ Kotman	14000	103000	1232	130	893	3236	32	15	9	18	50	4	35	0	159	5	10	2
21 Boswinkel/ de Braker	14900	119000	2546	274	1160	6770	95	37	50	63	111	32	102	4	229	22	33	8
22 Pathmos	12900	123000	1344	149	580	8829	16	16	18	36	33	12	71	1	31	4	24	5
23 Stevenfenne	13800	119000	3377	339	1137	8279	71	30	43	41	66	28	69	1	187	28	30	3
24 Stadsveld-Zuid	14700	118000	1092	136	453	6134	59	10	16	21	34	11	49	2	69	9	27	6
25 Elferink/ Heuwkamp	14000	135000	2137	201	450	4331	51	24	30	46	60	31	57	7	71	4	40	5
26 Stadsveld-Noord/Bruggert	15400	141000	1227	120	543	5914	48	10	24	21	18	6	33	4	94	6	17	0
27 't Zwering	20300	281000	1937	141	205	3490	91	11	30	23	31	8	38	1	42	7	15	2
28 Ruwenbos	19700	240000	1348	92	148	3332	30	15	6	16	27	8	21	3	13	7	7	3
30 Tubantia/ Toekomst	16100	140000	3897	405	744	4333	80	47	46	37	80	43	103	4	61	20	50	11
31 Twekkelerveld	13600	111000	2667	344	1151	4879	51	32	44	36	60	18	102	1	339	6	40	3
40 Walhof/ Roessingh	16900	166000	1924	228	313	3113	59	28	39	20	44	18	49	0	40	8	21	7
41 Bolhaar	24100	245000	1340	142	136	1048	56	27	52	29	69	12	76	5	60	7	22	1
42 Roombeek/ Roomveldje	16700	167000	2718	279	789	5231	49	46	59	39	57	31	93	2	113	16	37	8
43 Mekkelholt	14900	113000	1501	201	662	5699	14	27	25	18	14	5	26	4	188	4	26	0

44 Deppenbroek	14900	123000	2798	299	1644	6548	65	34	49	20	34	15	62	2	365	12	38	1
45 Voortman/ Amelink	15700	201000	999	74	174	1235	19	7	9	8	19	2	32	0	22	0	10	2
46 Drienerveld/ UT	13800	530000	1549	380	719	952	10	9	28	13	31	6	55	2	14	1	3	0
50 Schreurserve	15300	137000	1786	202	390	5174	47	17	25	33	16	12	34	2	65	12	13	3
51 't Ribbelt/ Ribbelerbrink	15100	134000	1454	160	409	6558	44	15	25	31	27	11	52	1	62	10	13	2
52 Park Stokhorst	18200	176000	2871	241	297	5529	165	24	51	30	38	26	129	4	43	8	24	12
53 't Stokhorst	27400	472000	855	85	58	1072	70	12	18	7	31	5	62	5	20	2	13	4
60 Stroinkslanden NO	19100	207000	2876	245	375	6018	191	17	28	22	51	13	82	3	85	3	20	9
61 Stroinkslanden Zuid	14400	117000	2619	303	1833	5845	143	39	50	20	45	17	85	4	221	12	27	19
62 Stroinkslanden NW	17100	171000	1919	155	266	4664	183	18	31	19	32	11	48	1	25	10	8	13
63 Wesselerbrink NO	14100	117000	2272	264	1499	4387	129	32	71	41	87	38	89	3	172	18	31	20
64 Wesselerbrink ZO	14500	142000	2395	259	1906	7550	159	30	38	27	39	12	38	2	60	6	24	11
65 Wesselerbrink ZW	14800	116000	1308	98	1095	3816	95	17	29	16	38	16	30	3	107	13	19	11
66 Wesselerbrink NW	15500	144000	2815	317	1940	4926	152	28	39	41	69	27	100	2	316	8	28	22
67 Helmerhoek Noord	18000	202000	3371	246	484	4164	145	20	36	39	54	11	42	2	46	13	21	13
68 Helmerhoek Zuid	16100	157000	3030	266	685	7952	167	22	37	18	43	14	21	0	53	9	17	26
80 Glanerveld	17100	177000	971	121	48	1336	18	13	21	3	18	8	29	2	14	1	8	0
81 Bentveld/ Bultserve	16300	175000	2501	336	209	3376	74	29	40	23	56	19	77	4	40	6	15	3
82 Schipholt/ Glanermaten	14800	144000	2157	295	493	5722	123	33	50	26	68	18	100	2	59	10	25	10
83 de Eekmaat	15300	161000	1324	186	290	4806	40	22	26	23	36	11	69	4	145	9	14	5
84 Oikos	17500	181000	1932	163	343	5787	54	23	12	8	15	7	71	3	34	11	10	3
87 Dolphia	14400	140000	451	39	35	971	11	6	5	9	15	4	16	0	13	1	3	0
88 Eekmaat west	18900	212000	2675	218	384	4031	75	26	31	22	55	25	61	2	36	15	19	6
90 Dorp Lonneker	19800	243000	1680	106	52	1950	54	22	51	33	38	13	121	1	13	1	21	6
91 Dorp Boekelo	20200	242000	2061	134	111	1244	122	31	50	28	34	15	77	3	32	8	17	4
92 Lonneker-West	20600	364000	1037	92	42	40	35	21	73	40	43	9	58	1	90	0	11	1
93 Noord-Esmarke	24400	413000	332	24	5	41	13	15	45	22	44	6	25	1	178	0	1	1
94 Zuid-Esmarke	18700	283000	191	21	0	44	28	15	36	20	48	5	11	1	80	6	2	1
95 Broekheurne	21700	345000	1235	106	56	53	58	23	86	42	62	10	31	1	129	3	15	0
96 Usselo	21600	368000	255	22	6	65	43	23	52	39	66	11	31	2	88	0	8	0
97 Goorseveld	17400	262000	803	70	39	67	24	19	38	25	40	4	19	1	37	0	2	0