

Urban stress(-ors) in the city of Groningen: valuing urban wellbeing through the use of softGIS

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Abstract

This study on urban stress in the city of Groningen focuses on experiences of stress in relation to urban wellbeing. The central research question is: '*How do urban stressors affect wellbeing in the city of Groningen?*'. The research question is answered through a mix of quantitative and qualitative geographical analysis which uses data obtained in a questionnaire survey among (former) inhabitants of the city of Groningen. Central to the analysis is a participative softGIS approach providing an extra data layer built on perception. The analysis shows that urban stress in the city of Groningen arises predominantly in the city centre and along main traffic routes. Contributing stressors concern primarily traffic and noise. Capacities of urban stress involve grumpiness, fatigue, and feelings of discomfort. Many respondents, however, experience urban stress only during the situation. Experiences of social stress occur among a less resilient group: respondents who experience stress and feel that this determines their state of mind at least. Whereas urban pathology appears limited in the city of Groningen, planning solutions concerning the separation of urban modes and the addition of greenery as multifunctional barrier may improve city functioning and city wellbeing.

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1. Introduction

Various studies have confirmed that mental as much as physical health is, in part, negatively affected by urban living. For instance, cities accommodate for overstimulation of the mind and a lack of predictability causes a decline in individual wellbeing (Adli et al., 2017; Lederbogen et al., 2011). At the same time, studies suggest that spatial planning is critical for creating stable and predictable conditions for development, securing community benefits, and the management of land use (Stead and Nadin, 2008). This calls into question: how can urban areas become more sustainable as a space for living? How can urban areas even enhance wellbeing?

To explore the interrelationship between urban functioning, wellbeing, and spatial planning, the concept of neurourbanism can be adopted. Neurourbanism aims to investigate the effect of built and social environments of cities on health (Adli et al., 2017). This then adds particular value in its interdisciplinary nature of spatial sciences, psychology, and pathology. In connecting the disciplines, new relations may be discovered.

So far, however, urban planners have largely failed to develop strategies coordinating the bidirectional interaction between urban life and wellbeing (Adli et al., 2017; Burton, 1990; Lederbogen et al., 2011). Even though a general relation between the occurrence of stressors and urban stress is determined, many studies in neurourbanism still reserve judgement concerning individual experiences of urban stress. However, individual experiences of resilience to stress should be at basis when developing tools to improve urban wellbeing. Similarly, spatial context matters. As potentially relevant to the planning process, possible determinants such as resilience and spatial context are compared to urban (pathological) stress.

This study resolves around two sorts of experiences of urban stress. Urban pathology refers to the occurrence of physical symptoms in the body due to urban stress. Other references to urban stress are subject to perception. To better understand individual perceptions of urban stressors, a softGIS approach is implemented. SoftGIS refers to a collection of surveys which allow the locality-based study of human experiences and everyday behaviour (Kahila and Kytä, 2009). According to Kytä et al. (2013), this ‘soft’, experiential information can be a welcome addition to the other layers of information in evidence-based planning. Moreover, there is explicit value in layers of localised knowledge while at the same time supporting public participation in science (Dickinson et al., 2012).

Then, the study aims onefold to come to an understanding of experienced urban stressors and wellbeing in the city of Groningen using a softGIS approach based on participative localised science. Twofold, the study aims to complement existing methodologies in the field by developing softGIS in a particular spatial context as a tailored operational tool to measure urban wellbeing.

In specific, the concept of urban stress invites to explore neurourbanism following the research question:

How do urban stressors affect wellbeing in the city of Groningen?

The quantitative analysis part of the study will answer the following questions:

What urban stressors are experienced in the city of Groningen?

Where do these stressors occur?

Then, in the qualitative analysis part and in the discussion part, the following question is outlined:

In what ways may spatial planning enhance city wellbeing?

The research questions are answered through a mix of quantitative and qualitative geographical analysis which uses data obtained in a survey among (former) inhabitants of the city of Groningen.

2. Theoretical framework

Many cities are still far removed from safe, clean, and liveable environments. Perhaps the most vivid yet morbid illustration of urban stress might be a laboratory study with rats. The experiment by Calhoun (1962) showed that constant exposure to stress would lead to either extinction or immense psychological costs for the rat population. Later, similar studies of density were conducted with humans. This time, however, the results proved inconsistent: psychological costs of the human population were significantly less. Concluded was that increased density might be inevitable, but human beings are to a sense capable of coping with clustering (Ramsden, 2009).

Indeed, urban stress affects ongoing urban pathology. Urban life often imposes a cognitive and psychological demand perceived as excessive (van den Berg et al., 2017; Lederbogen et al., 2011). Adli et al. (2017) explain urban wellbeing onward social density and the feeling of being exposed to an uncontrollable environment. Aside from social inducement, sensory inducement is relevant to urban experiences. Sensory overload has proven to affect numerous disadvantages to human cognitive development and results in a higher risk of the development of stress-related mental illnesses such as schizophrenia, depression, and anxiety disorder (van den Berg et al., 2017; Spence, 2020).

Chronic stress may undermine physical health through chronic arousal and immune suppression. A key explanation to urban pathology pertains to Attention Restoration Theory (ART). Kaplan (1995) argues that frequent exposure to urban stressors provokes mental complaints such as signs of directed attention fatigue and difficulty concentrating, increased irritability, and an increased rate of errors on tasks that require concentration. In particular, ART focuses on the notion that urban places often lack restorative quality as opposed to natural places. However, individual risk factors as well as social status determine one's resilience to stress-related health issues (Adli et al., 2017). Moreover, Kaplan's ART (1995) emphasizes that every place has different restorative qualities and urban areas may as well support restoration. Still, elaborating on ART, the occurrence of green spaces in the city seems of meaning. A study by Grahn and Stigsdotter (2003) shows that the more often a person visits urban open green spaces, the less often stress-related illnesses occur. Then, an ideal environment may be one free of social and sensory demands.

Personal risk factors that determine resilience to stress may be subject to genetic and physiological factors, gender, life stages, health, lifestyle, or simply personal perception and coping strategies. For instance, positive reassessment of stressors and problem-solving enforces resilience of the individual whereas avoidance of a stressor merely enforces susceptibility of the individual. Additionally, some individuals acknowledge stress to be helpful in challenging situations (Franklin et al., 2012).

Other factors influencing experiences of stress are subject to the duration of stress (short- or long-term exposure) and the frequency of occupying a certain situation of stress. Short-term exposure relates to reactions that are enduring for up to several hours. Such reactions occur to help individuals adapt while they are still in a situation with the stressor. Physical alteration can include changes in amongst others emotions, hormone levels, heart rate, blood pressure, body temperature, and muscle tension. Long-term exposure requires repeated stimulation prolonged over time. This kind of exposure needs more time to be reverted and may

be not reverted at all, especially if the stimuli that induced them are still present. Long-term exposure may lead to less functioning long-term memory and may impact genetic expression (de Paiva et al., 2019).

Following the theoretical framework, the following conceptual model has been established:

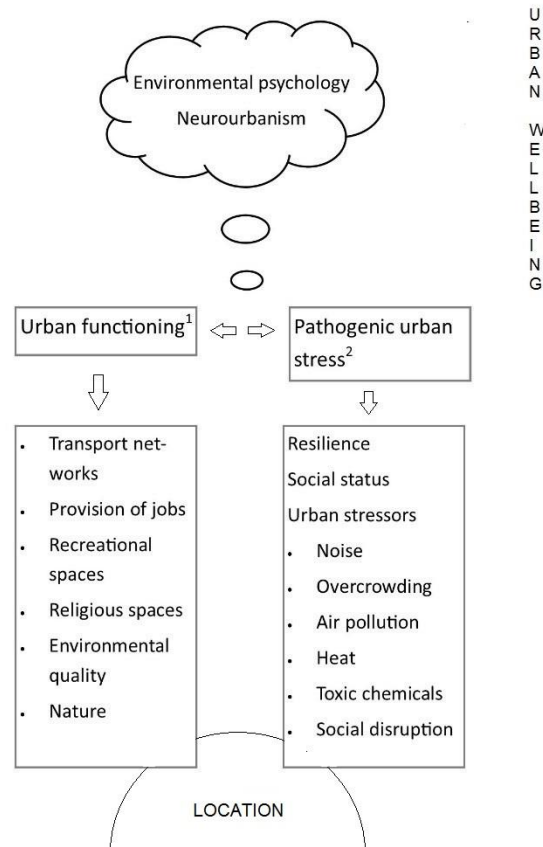


Figure 1 Conceptual model.

The overall research area of urban wellbeing lies in the field of environmental psychology with as concept neurourbanism. Within neurourbanism, the concepts of urban functioning and pathogenic urban stress are intertwined in such a way that they are mutually dependent. Pathogenic urban stress is negatively related to urban functioning, meaning that in the presence of urban stressors urban functioning decreases. The sum of both equals an extent of urban wellbeing. Then, urban functioning is defined by amongst others the transport networks, the provision of jobs, the presence of recreational and religious spaces, environmental quality, and the presence of nature (van den Berg et al., 2017; Burton, 1990¹). Pathogenic urban stress depends on amongst others noise, overcrowding, air pollution, heat, toxic chemicals, and social disruption (Evans et al., 1984²).

Based on the presented theoretical framework is it likely that the experience of urban stressors results in more feelings of stress, lesser city functioning, and thus lesser urban wellbeing. The extent to which this occurs may be dependent on a handful factors introduced in the theoretical framework.

To structure the data analysis and the geographical analysis, two respective hypotheses can be formed:

1. there is a positive relationship between the presence of several stressors (X_1, X_2, \dots) and feelings of stress (Y);
2. stressors centre around certain locations in the city with many sensory inducements.

3. Methodology

3.1. Methods

In the study, the level of analysis can be considered the micro-level, as the survey was conducted amongst individuals in the city of Groningen. Therefore, the unit of analysis and the unit of observation is similar (DeCarlo, 2018).

The study is based on a mix of quantitative and qualitative methods in a larger analysis section and a smaller discussion section. A mixed methodology was chosen to explicate the many concepts that relate to urban wellbeing and obtain an optimum understanding of urban phenomena in the city of Groningen. The use of single quantitative or qualitative data methods may have resulted in poorly substantiated findings as urban spaces are rich in information. By way of illustration, the formation of space and place is contingent upon multifaceted social, political, psychological, and spatial illumination (Jabareen and Eizenberg, 2021). Such excess factors make it hard to isolate phenomena from one another, and even harder to understand impacts individually. Consequently, additional geographical data in combination with a softGIS approach can help to dissolve singular impacts. By example, a substantial part of the survey data can be traced back to single locations. Moreover, the incorporation of qualitative responses assists in isolating individual perception. Reflected upon relevant research literature, softGIS is used as a valid and reliable way of operationalising complex environments (Kahila and Kytä, 2009).

3.2. Data collection

Data collection is done through a questionnaire (see appendix I), delivering both nominal and ordinal data as well as geographical data. The questionnaire measures whether each of the aforementioned hypotheses or explanations applies to the city of Groningen. The questionnaire is based on the features as presented in the theoretical framework and figure 1. The data was analysed by comparing amongst others urban stressors and capacities of urban stress to experiences of stress. In doing so, the analysis helps to understand localised wellbeing. Quantitative analysis is done singularly as well as through a crosstabulation. The questionnaire also contains a couple of short interview questions, hence providing some qualitative data. This data was analysed through coding in Atlas.ti (see appendix II) and summarised through a coding scheme. The geographical data displays itself through a pair of maps and is briefly outlined in the corresponding table.

The questionnaire was open to anyone who considers the city of Groningen as their activity space. This does not automatically have to mean that they live in the city. Eventually, each respondent turned out to be a (former) inhabitant of the city of Groningen. Consequently, respondents can be expected to provide accurate responses. To ensure inclusivity in the population, the questionnaire was presented in both Dutch and English. 69 respondents answered in Dutch and 17 respondents answered in English. The questionnaire includes multiple choice questions on the occurrence of urban stressors, the duration and frequency of urban stress, capacities of urban stress, coping strategies, and the role of spatial planning interventions in minimising urban stress. In designing the questions as well as the answer

options, the theoretical framework was consulted. Potential urban stressors and potential capacities were for example derived from the literature by Evans et al. (1984) and Kaplan (1995). Then, the literature of Franklin (2012) and De Paiva (2018) helped to draft a set of optional answers on coping strategies and the duration and frequency of stress. The questionnaire also includes the option to add some explanation to the given answers. This option was extensively used and secured the clarity of responses. Next to that, the open questions on urban stress and the role of spatial planning allow respondents to formulate answers in their own words. To provide a sense of understanding of the sample, several demographic questions were included. One respondent did not share their demographic characteristics.

Respondents were attained using the platform Maptionnaire, through which not only quantitative and qualitative data but also geographical data could be gathered. Maptionnaire is a community engagement platform assisting in collaborative participation processes. Key to the Maptionnaire tool is its map-based tools for data collection. The Maptionnaire questionnaire was published to the larger public on social media like LinkedIn. As such, the collected data partially depends on a social network. However, the sample does not necessarily involve certain segments of society. For the purpose of minimising the selection of respondents based on social characteristics, it was encouraged to share the publication. This resulted in a range of more than 1000 views of possible respondents in for example the branches of spatial planning and architecture, but also research and consultancy, healthcare, and ICT services. In addition, a neighbourhood platform called Nextdoor was used to obtain data. Nextdoor is a social platform to connect with people in neighbourhoods or city-wide. The platform is rather effective to access possible respondents because it contains a function to filter by location. As such, the publication was only visible to respondents who fit the target population.

Whereas the steps above attempt to eliminate possible biases, bias could not be prevented entirely. The quality of the study may be negatively affected because of the sampling technique based on convenient accessibility to respondents. In this study, convenience sampling meant that respondents are selected based on their willingness and time to participate in the survey. One alternative criterion was to be, at least, familiar around the city of Groningen. Because convenience sampling is based on easy access to the population, the sampling technique is at risk of not representing the population as specific respondents may reach out to the study. As a result, interest groups are likely to be dominant in the sample. Non-interest groups are similarly under-represented. Findings may therefore be valid for the sample, but not for the external population. Accordingly, findings should be regarded carefully when making statements about the target population (DeCarlo, 2018). Another cause of bias may be building findings and conclusions based on a case study. Hence, the study is as useful in generating new hypotheses as in testing the presented hypotheses. Case studies are difficult to generalise as the confidence of causal evidence between groups or factors is limited. Moreover, case studies often contain a bias towards verification. A greater number of case studies in other urban environments may strengthen the scientific paradigm (Flyvbjerg, 2006).

The findings are based on a total number of 86 respondents. Sample sizes may differ per question, as the questions were not obligatory and hence could be skipped. Also, some questions had multiple answer options, which may result in an exceeding number of responses than there were respondents. Relevant sample characteristics (see table 1) prove sufficient representability of the target population, though there are some limitations. First, there is a bias in the sample based on a majority of women as opposed to men. Second, although age groups seem rather dispersed, there is a slight bias based on a relatively small proportion of elderly, that being

respondents over the age of 75. Other than that, respondents did overall obtain a diploma in higher education.

Table 1 Sample characteristics (n = 85).

Gender	Age			Education		Living situation		Household composition	
Man	23	<18	0	No diploma	0	In a rural area	1	Alone	34
Woman	59	18 - 25	20	Primary school	0	In a town	2	With parents	0
Both	1	26 - 35	9	Secondary school	7	In the city (centre)	44	With partner	20
Neither one	2	36 - 45	14	Intermediate Vocational Education	4	In the city (suburb)	38	With partner and child(ren)	14
		46 - 55	14	Higher Vocational Education	30			With child(ren)	4
		56 - 65	14	University Education	44			With room-/flatmates	13
		66 - 75	12						
		>75	2						

3.3. Ethical considerations

When considering ethics, the positionality of the study can be considered considerably objective. The study has no negative implications for both the respondents or the larger public, although one should be careful with personal questions about (mental) health and demographics because of the potentially sensitive nature of the information sought. As such, respondents did not have to answer any question they do not want to answer. Additionally, participation was completely voluntary. In line with the principle of informed consent respondents' consent for the usage of the obtained data was requested. Likewise, respondents were in advance informed about the aim of the research, the content of the research, and their rights. To minimise power relations and to secure the privacy of the respondents, data was anonymised. The above is not only important in an ethical manner but also promotes societal acceptance and participation in academia (Hay, 2016).

4. Results

4.1. Discussion of findings

Table 2 and chart 1 display the occurrence of several urban stressors in the city of Groningen. The most frequently experienced stressors relate to crowds due to traffic (59 counts positive), noise (57 counts positive), and social disturbance (39 counts positive). The occurrence of air pollution is mentioned a few times but does generally not seem to concern respondents that much. Urban stressors regarding toxic chemicals are not mentioned at all (Evans et al., 1984).

Table 2 The occurrence and extent of experienced urban stressors in the city of Groningen.

	In the city, I sometimes suffer from noise (n = 84)	In the city, I sometimes suffer from crowds (traffic) (n = 83)	In the city, I sometimes suffer from air pollution (n = 84)	In the city, I sometimes suffer from heat (n = 83)	In the city, I sometimes suffer from disturbance (social) (n = 83)
Completely disagree	3	1	6	7	5
Disagree	10	8	20	22	16
Neutral	14	15	33	27	23
Agree	37	42	21	21	28
Completely agree	20	17	4	6	11

In the city, I sometimes suffer from...

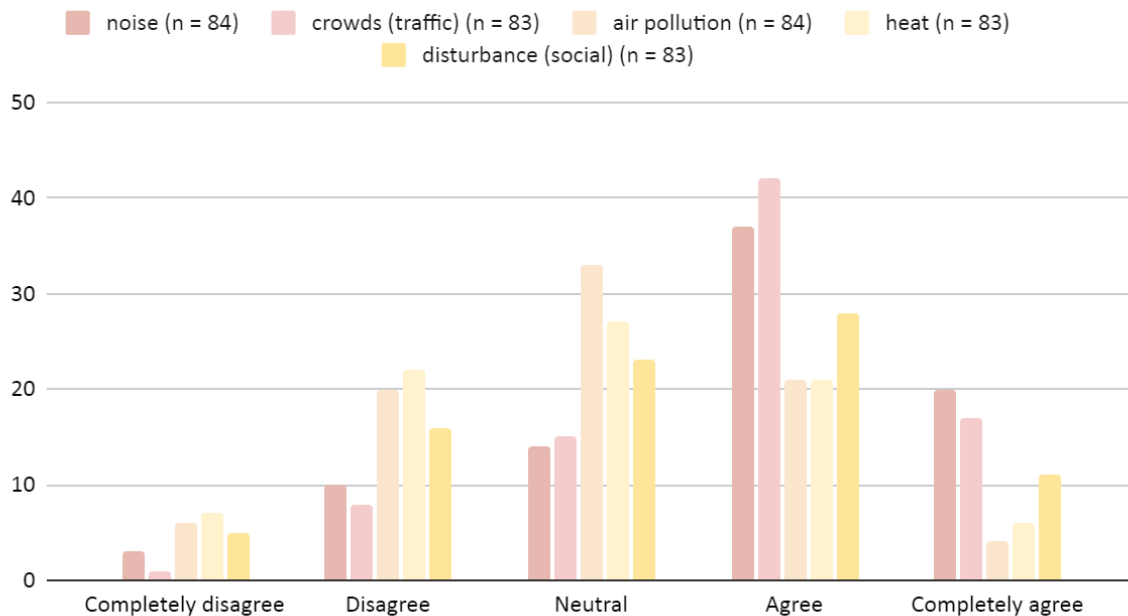


Chart 1 The occurrence and extent of experienced urban stressors in the city of Groningen.

When looking at the extent to which respondents experience urban stress this regularly takes shape through feelings of discomfort (36.4 percent), grumpiness (32.5 percent), and fatigue (16.6 percent) (see chart 2). These capacities of urban stress do not involve physical symptoms of stress but relate to perception. This suggests the occurrence of pathological urban stress in the city of Groningen is limited. A small but still considerable proportion (14.5 percent) state they do experience physical complaints as a result of urban stress. Symptoms including sweating or shaking may relate to anxiety disorders whereas abdominal pain, dizziness, and abdominal pain may relate to more severe pathology, either directly due to stress or indirectly by stressors that alter physical wellbeing (van den Berg et al., 2017; Spence, 2020). Alternatively, fatigue or feelings of discomfort may relate to difficulty concentrating and increased irritability (Kaplan, 1995).

Capacities of urban stress (n = 151)

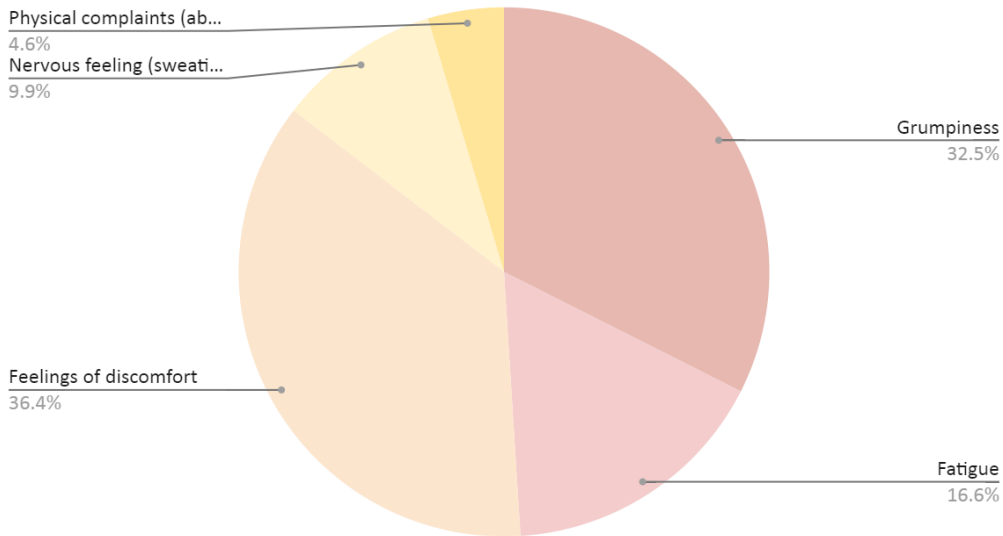


Chart 2 Capacities of urban stress in the city of Groningen.

Chart 3 shows that up to 86.5 percent of the total respondents experience urban stress in the city of Groningen, as opposed to 13.5 percent who do not - or little - experience urban stress. Differences in capacities of urban stress can be explained forth individual resilience to stressful situations. In terms of coping with stress a minority of 8.1 percent attempts to eliminate urban stressors at times. When crossing those who experience social disturbance (39 counts positive, 44 counts negative) with their coping strategy, most respondents state that stress determines their state of mind (see chart 4). Those respondents indeed appear to be less resilient to stress (Franklin et al., 2012).

Urban stress and coping (n = 74)

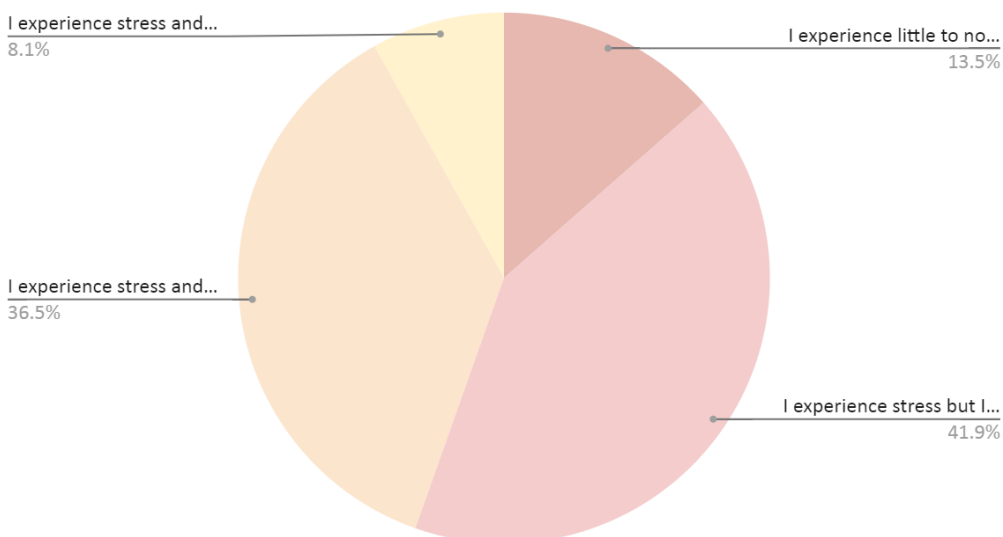


Chart 3 Urban stress in the city of Groningen and coping.

Experienced social disturbance versus coping (grouped) (n = 39)

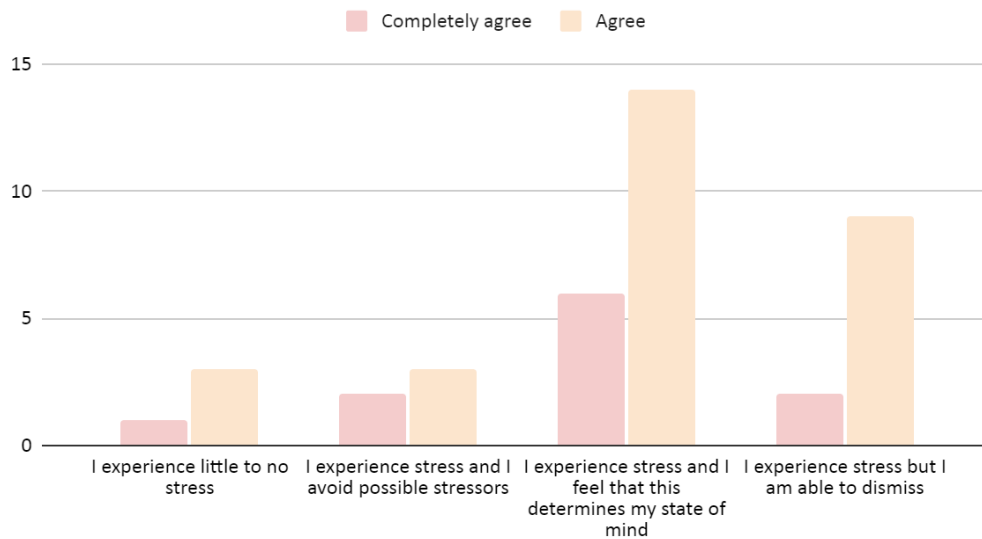


Chart 4 Experienced social disturbance in the city of Groningen versus coping (grouped).

Concerning the duration of urban stress (see chart 5), almost all respondents experience stress only during the situation. A few respondents (3 counts positive) state they experience urban stress a few hours after the situation, and a handful respondents (6 counts positive) state that they experience constant stress. This is in line with found capacities of urban stress, where a minority pointed out that they experience physical complaints which often come up only after long-term exposure to urban stressors. The frequency of occupying certain situations of stress proves on the other hand more distributed, although a majority does experience urban stress a few times which does again point at few physical complaints due to urban stress (see figure 6) (de Paiva, 2019).

Urban stress and duration (n = 125)

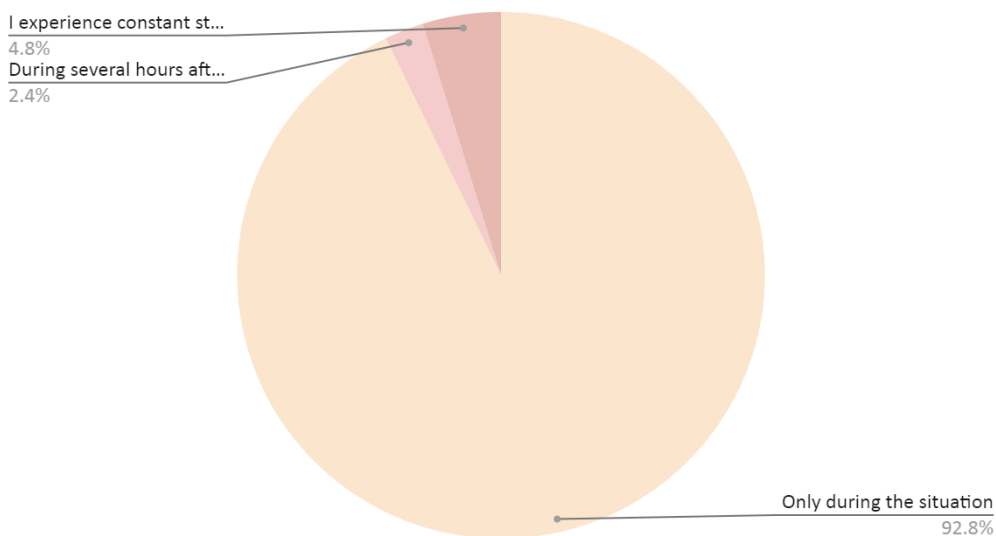


Chart 5 Urban stress in the city of Groningen and duration.

Urban stress and frequency (n = 128)

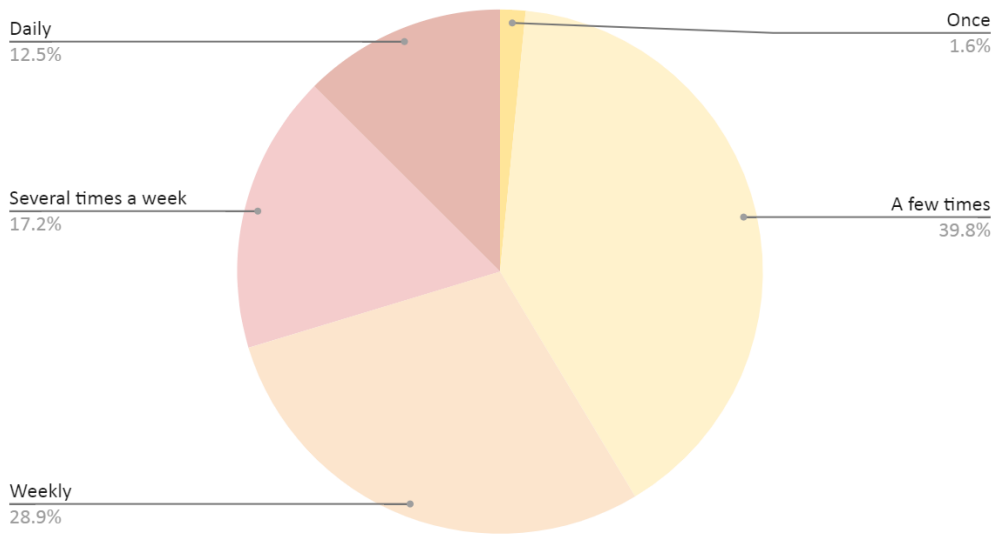
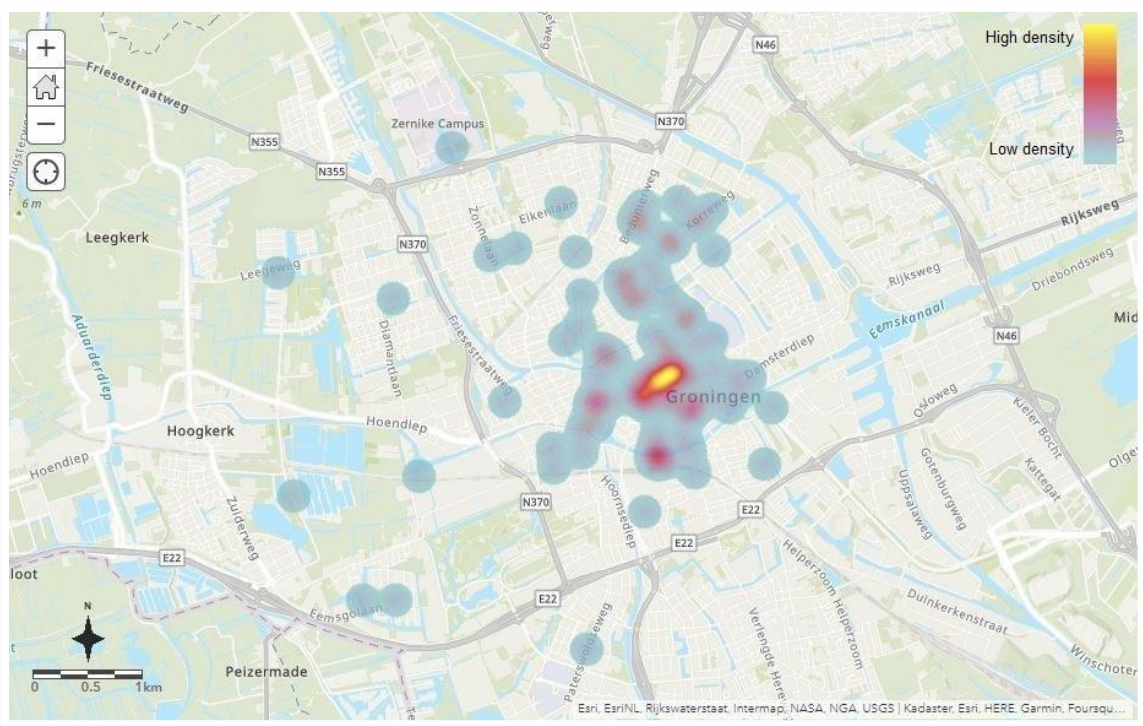


Chart 6 Urban stress in the city of Groningen and frequency.

Locations where urban stress occurs are widely spread over the city of Groningen, though dispersed around the city centre and along main traffic routes. The occurrence of stressors in the centre complies with several studies underling excessive sensory inducement as a primary factor contributing to urban stress (van den Berg et al., 2017; Spence, 2020).

Summarising the responses, map 1 and map 2 display the locations where respondents experience urban stress. The most frequently mentioned locations of urban stress are outlined in table 3.

Map 1 Locations of urban stress in the city of Groningen sorted by density (n = 133).



Map 2 Locations of urban stress in the city of Groningen (n = 133).

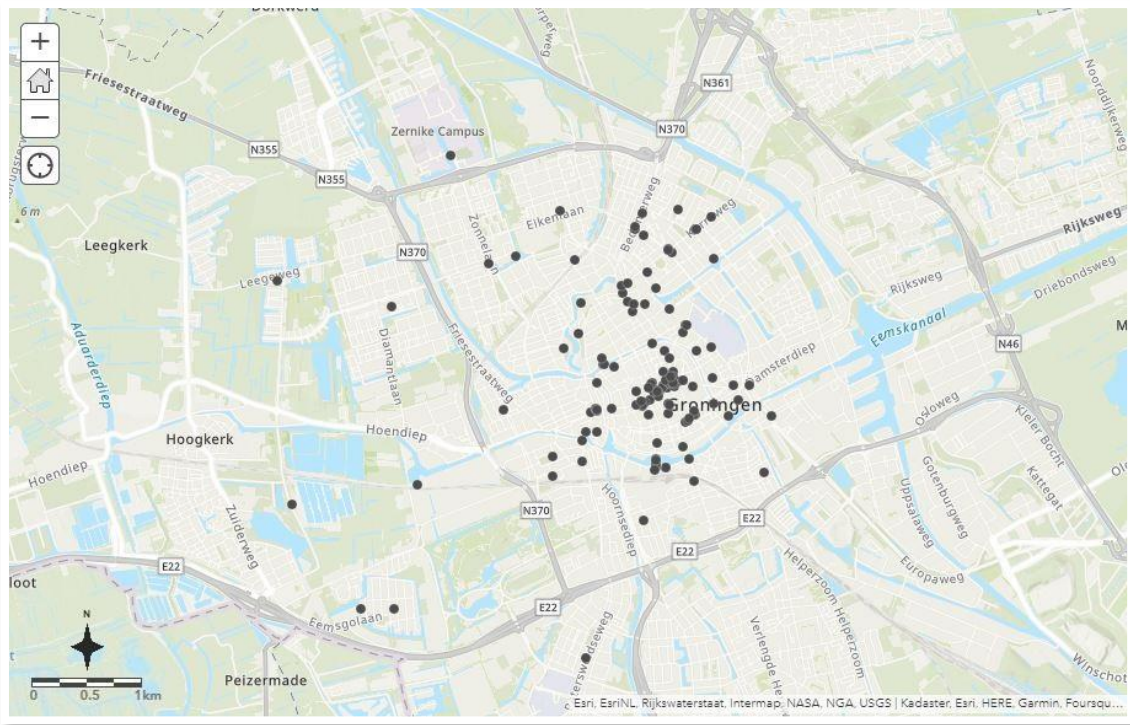


Table 3 Top 5 frequently mentioned locations of urban stress in the city of Groningen (n = 133).

Location	Counts
1. Grote Markt	13
2. Vismarkt/Akerkhof	13
3. Hoofdstation/Museumeland	9
4. Korreweg	7
5. Gedempte Zuiderdiep/Kattendiep	5

The quantitative geographical analysis shows that the reasons for occurring stress often pertain to crowds and traffic leading to unsafe, and, as Adli et al. (2017) argue, uncontrollable situations. Other reasons may often be noise, or to a lesser extent air pollution and heat. Figure 2 summarises the findings derived from the qualitative geographical analysis. In the qualitative analysis, experiences of and solutions to urban stress are clarified. In the coding scheme, a distinction has been made between general and location-specific responses. Comparing analysis-based experiences of urban stress - both quantitative and qualitative - to the conceptual model, responses related to urban functioning as transport networks, recreational spaces, environmental quality, and nature can be recognised (van den Berg et al., 2017; Burton, 1990). Likewise, urban stressors such as noise, heat, overcrowding, and social disruption can be identified (Evans et al., 1984).

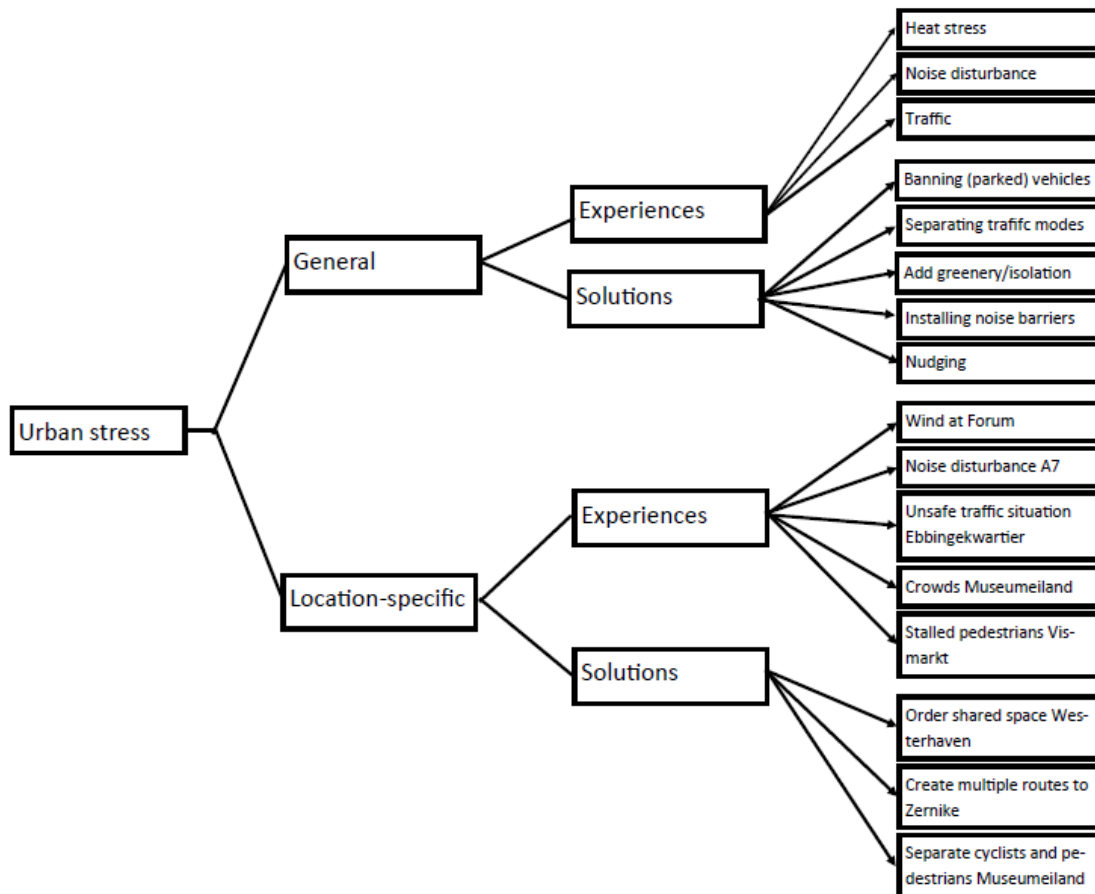


Figure 2 Coding scheme.

A recurring stressor in the qualitative analysis is disturbance due to traffic throughout the entire city. In the city centre, it is argued that parked vehicles, in particular bikes, should be banned. When asked how to resolve city-wide disturbances, many respondents point out that the separation of different traffic modes (motorised traffic, bicycles, and pedestrians) and better-organised traffic intersections could reduce stress and improve traffic circulation. Sometimes the understanding of a situation is simply inadequate. However, a large part of the problem is maintained by the behaviour of other road users - speeding, not giving way, et cetera - which makes respondents also advocate for more control by authorities and higher fines. Another proposed solution to manage traffic is nudging: to favour desirable behaviours by deceiving users' perceptions. For instance, one respondent suggests crowd management by placing footsteps on areas designated for walking. Furthermore, respondents suggest investing in the accessibility of public transport to all and creating more pick-and-ride spots around the city.

Stressors such as noise, air pollution, and heat similarly occur in the qualitative analysis and may affect wellbeing and physical conditions directly. A few respondents do not only worry about physical stress that occurs in the moment, but also about physical complaints that develop over time due to frequent exposure to certain stressors. Consequently, respondents suggest reducing loud and polluting vehicles in the city. Also, respondents complain about noise disturbance due to nightlife and advocate for more control and management. Respondents additionally mention taking into account the size and shape of buildings when designing construction plans because of their effect on the circulation of for example heat and noise. Likewise, the addition of greenery in places with lots of stone and concrete is largely

recommended. Respondents emphasize the many functions greenery can fulfil to eliminate urban stressors as greenery can add to better acoustics and absorb heat while at the same time improving visuals. Moreover, respondents believe that green spaces help combat stress through their restorative qualities (Grahn and Stigsdotter, 2003; Kaplan, 1995).

Finally, respondents remark that experiences of stress are an inherent part of urban life. Those respondents tend to look at the benefits of living in the city: urban living does account for the maintenance of social life and, next to that, accentuates the importance of maintaining historical narratives.

4.2. Synthesis

Rethinking urban spaces requires a lot of planning, investments, and above all a change in habits. In applying neurourbanism, design can nudge people to change specific behaviours. Many neurological processes occur unconsciously, allowing to control behaviour without people noticing it. Design features on the environment, for example image, sound, and smell, can be used to force cognitive processes (de Paiva, 2018).

Transforming the urban is a strategic process that can take over a few decades. The process of redesign should start at places located in strategic spots, balancing, and distributing possible stressors over the city. The role of planners and architects is to organise a coherent order of spaces, create easing sensory arrays, and manage social processes (Popova, 2020). Environmental factors affect quality of life over an entire life span, regardless of age, background, or capabilities. For populations to age happy and healthy, spaces should be designed collaboratively, supporting outdoor activity and community engagement. Long-term tools allow to nurture lifelong stress resilience among individuals. Crucial is social connection, meaning access to others and access for all (Scott, 2018).

Combining all findings, a summary of tools for urban wellbeing can be defined. Urban spaces should:

- be legible and add to safety;
- optimise mobility and allow for easy navigation;
- have green spaces;
- be designed to use all senses;
- include public spaces that support social interaction and maintain cultural features.

However, there is no set of rules for what is right or wrong. A single urban environment may have very distinct features. For the city of Groningen, tangible spatial solutions may entail:

- the addition of greenery in the city centre;
- to ban (parked) vehicles in the city centre;
- to install or strengthen noise and speeding barriers around busy roads such as the A7, Korreweg, Noorderhaven, Gedempte Zuiderdiep;
- more control and management of noise around nightlife areas such as the Poelestraat;
- the separation of traffic modes in critical areas such as Westerhaven, Ebbingekwartier, Vismarkt, Museumeiland.

5. Conclusion

This study aimed to understand how urban stressors affect wellbeing in the city of Groningen through a quantitative and qualitative geographical analysis of urban stress. Even though earlier studies were used to establish the theoretical framework and test corresponding hypotheses, this study adds value in evaluating the role of different coping strategies and spatial context and in introducing 'soft' evidence on capacities of urban stress. The use of softGIS, as the interface between geographic information science and geographical social theory, and local knowledge results in a combination of citizen and expert science. Thereby, this study further develops an effective research tool for operationalising urban stress in a spatial context. Moreover, this study proposes tangible planning tools to improve city functioning and wellbeing, specifically the addition of greenery as multifunctional barrier and the separation of urban modes.

The findings follow a common thread in the literature. As expected, sensory and social inducement prove to harm wellbeing in the city of Groningen. Urban stress in the city of Groningen arises predominantly in the city centre and along main traffic routes, pointing towards traffic and noise as primary contributing stressors. Experiences of social stress occur among a less resilient group, confirming the role of coping strategies in individual perception of urban stress. Nevertheless, some discrepancies can be identified. In particular, demands of urban life are experienced as excessive in the city of Groningen but do not manifest through an urban pathology. Instead, respondents experience stress expressed as grumpiness, fatigue, and feelings of discomfort.

Discrepancies may underline the relevance of spatial context. Applying the findings of this study in a wider or separate spatial context can result in impaired conclusions. Case studies are difficult to generalise as the confidence of causal evidence between groups or factors is limited. Especially rich spaces as the urban make it hard to isolate phenomena. Also, faulty generalisation can occur. The use of convenience sampling is at risk of findings being not necessarily valid for the target population as well as presenting different findings with a different sample of the target population.

Future research may involve exploring personal characteristics as opposed to experiences based on statistical significance. This would allow for not only to make inferences about the population of Groningen in general but to also make inferences for more specified groups within the population. For example, an elongation of the study may test the impact of resilience on experiences of urban stress along probability levels. Differently, a comparison to other urban areas, both in similar contexts - for instance the city of Oldenburg - and completely different ones - for instance the city of Yogyakarta -, may be of interest to help understand the importance of the spatial context, living conditions, and individual factors. Another alternative suggestion may be to explore the feasibility of some of the suggested solutions. For instance, living labs may be set up within the city as an extensive tool in participative research methodologies.

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Appendices**Appendix I*****Questionnaire urbane stress (Maptionnaire)***

Voor mijn scriptie doe ik onderzoek naar het bestaan van stress in de stad, ook wel urbane stress genoemd. Het onderzoek voer ik uit in de stad Groningen. Alle vragen zijn van toepassing op de stad Groningen.

Ik zou u ten behoeve van het onderzoek graag een aantal vragen stellen. Dit zal ongeveer 5 à 10 minuten duren.

De vragen zullen onder andere gaan over urbane stressoren. Hiermee bedoel ik factoren in een stedelijke omgeving die u stress opleveren, bijvoorbeeld geluidsoverlast.

Uw antwoorden zullen volledig worden geanonimiseerd. Dat betekent dat er, behalve een aantal demografische kenmerken, geen persoonlijke informatie van u wordt opgeslagen. Als er vragen zijn die u niet wilt beantwoorden dan is dit te allen tijde mogelijk.

1)

MC: In de stad heb ik soms last van ... (geluid/drukte (verkeer)/luchtvervuiling/warmte/verstoring (sociaal))

Helemaal niet mee eens

Niet mee eens

Neutraal

Mee eens

Helemaal mee eens

2)

MA MAP: Geef aan op welke locaties in de stad u wel eens urbane stress ervaren heeft

...

Per locatie

MC: Met welke regelmaat heeft u hier stress ervaren?

Eenmalig

Een aantal keer

Wekelijks

Meerdere malen per week

Dagelijks

MC: Wat is de (gemiddelde) tijdsduur waarover u deze stress ervaart?

Alleen gedurende de situatie

Gedurende enkele uren na de situatie

Gedurende enkele dagen na de situatie

Ik ervaar constante stress

Anders, namelijk ...

OA: Waar kwam deze stress door? Was er een concrete oorzaak of had dit een persoonlijke reden?

.....

~

3)

MA: In welke hoedanigheid ervaart u urbane stress?

Chagrijn

Vermoeidheid

Gevoel van ongemak

Nerveus gevoel (zweeten, trillen, etc.)

Fysieke klachten (buikpijn, duizeligheid, hartkloppingen, etc.)

Anders, namelijk ...

MC: Hoe gaat u gewoonlijk om met stress?

Ik ervaar weinig tot geen stress

Ik ervaar stress maar ik kan het van mij afzetten

Ik ervaar stress en ik merk dat dit mijn gemoedstoestand bepaalt

Ik ervaar stress en ik ga mogelijke stressoren uit de weg

Anders, namelijk ...

OA: Op welke manier denkt u dat ruimtelijke ordening het voorkomen van urbane stress kan beperken?

.....

OA: Kunt u een oplossing toepassen op een specifieke situatie?

.....

MC: Met welk geslacht identificeert u zichzelf?

Man

Vrouw

Beide

Geen van beide

MC: Wat is uw leeftijd?

< 18

18 - 25

26 - 35

36 - 45

46 - 55

56 - 65

66 - 75

> 75

MC: Wat is uw hoogst behaalde diploma?

Geen diploma

Basisonderwijs

Voortgezet onderwijs

MBO

HBO

WO

MC: Wat is de samenstelling van uw huishouden?

Alleen

Met ouders

Met partner

Met partner en kind(eren)

Met kind(eren)

Met huisgenoten

MC: Wat is uw woonsituatie?

Op het platteland

In een dorp

In de stad (centrum)

In de stad (buitenwijk)

MC: Bent u woonachtig in de stad Groningen?

Ja

Nee

OA: Wilt u graag nog iets toevoegen aan uw antwoorden?

.....

MC: Ik bevestig mijn deelname en ik geef toestemming voor het gebruik van de verkregen data voor onderwijs- en onderzoeksdoeleinden.

Ja

Appendix II***Codes for summarising (Atlas.ti)***

Code	Markeringen
Ervaringen met urbane stress	15
Oplossingen voor urbane stress	74
Locatiespecifieke ervaringen	19
Locatiespecifieke oplossingen	23