

Actual versus Perceived Environmental Quality in Kamp-Lintfort

How does the objectively measured environmental quality correspond to the perceived environmental quality and affect the perceived health of people in Kamp-Lintfort?

University: Rhine-Waal University of Applied Sciences

Faculty: Communication and Environment

Module: IP07_IP 2018: Perceived versus Actual
Environmental Quality in Kamp-Lintfort

Type of Paper: Interdisciplinary Project Report

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Due date: January 25, 2019

Abstract. The importance of the issues environment and environmental protection have steadily increased. Each year, approx. 400,000 people die as a result of climate change (Umweltschutz.de, 2016). Previous research has barely coped with the comparison of actual and perceived environmental quality, even though people have continuously been confronted with environmental issues by media. In order to extend existing research considering the relation between green spaces and perceived health by adding groundwater quality, tap water quality, air quality and traffic noise, the present study examines the extend to which actual and perceived environmental quality mismatch and if perceived environmental quality correlates with perceived health. Therefore, a questionnaire was conducted online and in the field in Kamp-Lintfort. Using the Perceived Environmental Quality Index, the mismatch between actual and perceived environmental quality could be demonstrated. Further, small to moderate significant correlations between perceived environmental quality and perceived health were found, except for traffic noise. Results are discussed and used to give outlook and implications on future research.

Keywords: actual environmental quality, perceived environmental quality, comparison, PEQI, perceived health, Kamp-Lintfort

Zusammenfassung. Das Thema Umwelt und Umweltschutz gewinnt zunehmend an Bedeutung. Jedes Jahr sterben ca, 400.000 Menschen als Folge des Klimawandels (Umweltschutz.de, 2016). Bisherige Forschung hat sich kaum mit dem Abgleich der tatsächlichen und der von Menschen wahrgenommenen Umweltqualität beschäftigt, obwohl Menschen durch die Medien laufend mit Umweltthemen konfrontiert werden. Um bestehende Forschung zu Zusammenhängen zwischen Grünflächen und der wahrgenommenen Gesundheit zusätzlich um Grundwasser-, Leitungswasser- und Luftqualität sowie Lärmbelästigung durch Straßenverkehr zu erweitern, überprüft die vorliegende Studie, inwieweit wahrgenommene und tatsächliche Umweltqualität voneinander abweichen und ob wahrgenommene Umweltqualität mit der wahrgenommenen Gesundheit korreliert. Dazu wurde eine online und Felderhebung anhand eines Fragebogens in Kamp-Lintfort durchgeführt. Mithilfe des Perceived Environmental Quality Index konnte gezeigt werden, dass die wahrgenommene nicht mit der tatsächlichen Umweltqualität übereinstimmt. Außerdem konnten schwache bis moderate signifikante Korrelationen zwischen der wahrgenommenen Umweltqualität und der wahrgenommenen Gesundheit festgestellt werden. Lediglich für Lärmbelästigung durch Straßenverkehr ergab sich keine Korrelation. Die Ergebnisse werden diskutiert und Ausblicke und Implikationen für weitere Forschung abgeleitet.

Schlüsselwörter: Tatsächliche Umweltqualität, wahrgenommene Umweltqualität, Vergleich, PEQI, wahrgenommene Gesundheit, Kamp-Lintfort

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LIST OF ABBREVIATIONS

EAQI	European Air Quality Index
EBA	Eyller Berg Abfallgesellschaft
EU	European Union
i.e. –	Id est, Latin for “this means”
LaGa	Landesgartenschau
LANUV	Landesamt für Natur Umwelt- und Verbraucherschutz Nordrhein-Westfalen
LINEG	Linksniederrheinische Entwässerungs-Genossenschaft
m	Meter
n.d. –	No date
NO ₂	Nitrogen dioxide
NRW	North Rhine-Westphalia
O ₃	Ozone
PCB	Polychlorinated biphenyls
PEQI	Perceived Environmental Quality Index
PM10	Particulate matter
RAG	Ruhrkohle AG
SO ₂	Sulfur dioxides
UVO	Umweltdaten vor Ort
WHO	World Health Organization

LIST OF SYMBOLS

English character set

CI	Confidence Interval
M	Arithmetic mean
p	Probability
r	Pearson product-moment correlation coefficient
SD	Standard deviation
t	t -value
N	Total number of cases

Greek character set

α	Cronbach's alpha
β	Standardized regression weight
μ	Population value
μg	Microgram

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“A clean environment is a human right like any other. It is therefore part of our responsibility toward others to ensure that the world we pass on is as healthy, if not healthier, than we found it”. (Dalai Lama, n.d., para. 4, as cited in Hodder & Stoughton, 1990, pp 280). This quote from the Dalai Lama should have made us think already in the 1990s. Today, 28 years later, this issue is more present than ever. There are lively discussions all over the world about how to save our planet. This being more than necessary is shown by the counts of Umweltschutz.de (2016) which visualizes, among others, the amounts of produced luxury goods or birth rates while visiting the website. The world's population is four times as large as 100 years ago, so currently, more than seven billion people live on this earth. Every single one of them has needs and demands which have led to an increase in consumption. Where meat used to be a luxury to eat, it nowadays is a matter of course for almost everyone. The demand for mobile phones, computers, cars and other luxury goods are constantly increasing. Production has an enormous impact on the environment (Umweltschutz.de, 2016). 80.00% of the world's population has access to electricity – and the trend is rising. The combustion of fossil fuels accumulates quantities of CO₂ in the atmosphere. As a result of all these changes, about 50,000 animal species become extinct every year and 400,000 people die as a result of climate change (Umweltschutz.de, 2016). However, for some years now, there has been a change in attitude towards the environment. People want to live more sustainably and are developing an increasingly greater environmental awareness (Umweltbundesamt, 2015b). According to a survey conducted in 2018, 68.00% of all respondents indicated that they wanted to buy and consume more consciously in order to promote sustainability (Statista, 2019b). This development can be traced back to the origins of the 1970s, when the environment became a policy area in its own right as a result of increased environmental awareness (Pokorny, 2001). An environmental report was also established in Germany in 1996 to implement sustainable development (Deutscher Bundestag, 1996). From the findings on the increased interest in environmental issues, the aim of the present research work is to examine whether the actual data on environmental quality correspond to those on perceived environmental quality and whether this has an influence on the perceived health of the inhabitants of a city. The study was limited exclusively to the city of Kamp-Lintfort.

1 Theoretical Background

1.1 Introduction of Kamp-Lintfort

Kamp-Lintfort is a former mining city in the west of Germany in the state of North Rhine-

Westphalia (NRW), as can be seen in figure 1. It covers an area of 63.12 km² of which about 52.53%, equaling 32.16 km², are agricultural or forestry land, with a population of 38,510 people (Stabsstelle Geoinformation, n.d.). It is the location of the second campus at Rhein-Waal University of Applied Sciences.

Figure 1. City of Kamp-Lintfort located in a map of Germany.



Figure 1. Source: Postleitzahl Service (n.d.).

1.1.1 Historical Data

The city of Kamp was founded through monks who built a monastery called Camp, from Campus (lat. field), in around 1128 which was one of the origins of the current city (Kamp-Lintfort., n.d.b). After the monastery lost its importance in 1802, it belonged to the cities Rheinberg, Geldern and Moers. The second part of the town, Lintfort was mainly unknown until its black coal mining site Friedrich Heinrich which was founded in October 1906. This led to a drastic increase in the city's importance from 1906 to 1930, and thus, a rise in population by 494% from 3.748 to 22.261 inhabitants. In 1934, the cities were combined and the name Kamp-Lintfort was established. The former mine Friedrich Heinrich was closed in 1957 and the *Ruhrkohle AG* (RAG) took over operation of the mine as *Bergwerk West* (Kamp-Lintfort., n.d.b). Operation of the mine has ended in 2012 and new plans are developed to use the former mining area for the *Landesgartenschau 2020* (LaGa; Drees, & Sommer, 2011).

1.1.2 Environmental Data

Kamp-Lintfort is part of the German *Ruhrgebiet*, an area which is known for its mining and industrial activities. In the past, this area was known for its high air pollution, as all industrial areas in Europe (Abi-pur.de., 2017). A high number of factories and no policy about emission control led to exhaust gases being released to the environment untreated. The high concentration of contaminant in the air consisting of particulate matter (PM10), nitrogen dioxide (NO₂), sulfur dioxides (SO₂) and ozone (O₃) led to negative health effects in the population. This has gradually been changed by amendments of policies and regulations from 1975 to 2000 (Bruckmann, Pfeffer, & Hoffmann, 2014). One important regulation was the Federal Immission Control Act which was established in 1990 and has then constantly been amended until 2017. This constantly changing standard results in the necessity to regularly modernize the facilities. Today, the regulation states that the “best available technique” (Environmental Law Alliance Worldwide, 2002, p.6) as stated by the *Bundes-Immissionsschutzgesetz* is to be used for emission control to prevent negative effects on air, water or soil. As Germany is part of the European Union, standards on environmental quality were decided on and have to be reported and implemented. These standards concern drinking water policy, noise and emissions from traffic, surface water regulations and chemical use and standardization of such as well (European Commission, 2016).

This led to a constantly monitored environmental status of Germany, improving the environmental status to comply with the regulations. The environmental quality in NRW has thus improved and the government agency *Landesamt für Natur Umwelt- und Verbraucherschutz Nordrhein-Westfalen* (LANUV) measures and evaluates the status of media and publishes the data online for public information. Different local associations assure the quality of natural resources. In Kamp-Lintfort, the *Linksniederrheinische Entwässerungs-Genossenschaft* (LINEG; Haatjans, H., personal communication, October 29th, 2018) has been responsible for the regulation of water discharge and wastewater treatment as well as water maintenance, landscape planning, monitoring of water quality, regulation of groundwater levels, procurement and provision of water for drinking and industrial water supply and the disposal of waste generated during operation in the area of environmental protection since 2003. Compliance with all environmental protection regulations is a basic prerequisite for LINEG to fulfil these largely environmentally relevant tasks. It is LINEG's aim to use its environmental policy to minimize the environmental impact associated with the company and to achieve a continuous improvement in environmental performance

(LINEG, n.d.). The *Stadtwerke Kamp-Lintfort*, on the other hand, assure good drinking water quality, electricity and gas and heat supply and the municipality caring for clean public places. Even though the environmental situation in the Ruhrgebiet has improved, there are still factors making compliance to the regulations difficult. These are for example the nitrate concentration in groundwater due to heavy use of fertilizers (Umweltbundesamt, 2008) and the NO_x concentration due to heavy traffic and emissions of especially diesel fueled cars in cities, for example (LANUV, 2001). In Kamp-Lintfort, these influencing factors, also called point sources, are some institutions located in the area in addition to the already existing problem of nitrate concentration in groundwater in NRW. These point sources are the residues of the mining site, a waste incineration plant called *Asdonkshof*, a toxic waste disposal location called *Eyller Berg* and traffic.

The coal mine was closed and the residues of surface pollution are cleaned up. These are transported to the location of the plot that is most contaminated and the hill is then covered up and sealed so that no leaching into the groundwater is possible (Drees, & Sommer, 2011). During mining activities, tunnels were dug, and to produce coal, the groundwater level had to be lowered by pumping. This water is called *Grubenwasser*. According to reports, the water of the *Fossa Eugeniana* which was the stream where the *Grubenwasser* from the *Bergwerk West* was disposed of has elevated Polychlorinated biphenyls (PCB) values (LANUV, 2018; Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen., n.d.). The source of PCB is mainly oil used underground which contained PCB to prevent sparks and sources of fire. The pumping was reduced after the mine was closed, leading to a rise in groundwater level and also a washing out of the contaminants still present in the old tunnels. Therefore, the groundwater in the closer surrounding is treated and purified, too (Kamp-Lintfort, 2012).

At the *Asdonkshof*, organic waste and general household waste is collected. The organic waste is then composted on site and the household waste is incinerated producing heat and electricity. The exhaust gases of the plant are treated and comply with the standards. The ashes are then landfilled (Asdonkshof, 2019).

The *Eyller Berg* has been used as waste disposal site since 1960 because of its soil structure. There was a waste disposal site for municipal waste and also mining residues were stored in a part of the *Eyller Berg*. Since 1975, the *Eyller Berg Abfallgesellschaft* (EBA) has operated a waste disposal site of the classification DK-III meaning that hazardous waste is stored at the location (Eyller-Berg Abfallbeseitigungsgesellschaft mbH, 2013).

Traffic is, as in any city, a source of exhaust gases and noise. Because of the highways A42 and A57, there is a constant source of noise in the outskirts of Kamp-Lintfort. The rest of the city is rather quiet. The exhaust gases contain different kinds of contaminants further described in the results part of this paper. Small particles from the wheels of the cars also act as a source of microplastic (Kole, Löhr, Van Belleghem, & Ragas, 2017; Sommer et al., 2018).

1.2 Literature Research

Previous research shows many approaches in evaluating the relationship between actual and perceived environment. Most studies are investigating the relationship between green spaces and health. The difference of most studies investigating those topics is how they measure and define health. For instance, Takano, Nakamura and Watanabe (2002) studied the association between public green spaces in the neighbourhood and the longevity of senior citizens in a densely populated city. Hence, their definition of health is the probability of senior citizens surviving the following five years. The results show that living in areas with walkable green spaces nearby has a positive influence on the longevity of senior citizens. Age, sex, marital status and socioeconomic status have no impact on the effect. Takano, Nakamura and Watanabe (2002) conclude that public green spaces in the neighbourhood should be further highlighted in urban planning and development because of their positive effects on health and longevity.

Other studies showed a relationship between green spaces and mental health. Wood, Hooper, Foster, & Bull. (2017) found out that the overall number and total area of public green spaces were associated with greater mental well-being. This effect was significant. Another study showed a relationship between perceived health (physical and mental) and actual green spaces, as well as perceived health and urbanity. It was found that perceived health was better in greener environments and also in less urban areas (Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006). A study by White, Alcock, Wheeler, & Depledge (2013) investigated if green space and mental health and well-being correlate with each other. They found out that people in greener spaces are happier, less stressed and report higher well-being. Similar results were found by Nielsen and Hansen (2007) with the additional finding that short distances to green areas are also associated with a lower likelihood of obesity. Mitchell and Popham (2007) did a similar study to White et al. (2013), where they concluded that more green spaces in an area were associated with better mental and physical health.

These findings are also supported by a study by Alcock, White, Wheeler, Fleming, and Depledge (2014) who found out that three years after moving to greener areas, people's mental health improved significantly. Further results are that people who moved to less green areas showed a significant decrease regarding their mental health one year after moving but returning to baseline in the following years. Van Herzele and de Vries (2012) also support these findings. In their study, they found out that self-reported happiness differed significantly referring to different neighborhoods. In the greener neighborhood, people tend to be happier and more satisfied. Stigsdotter et al. (2010) also found an association between the distance to a green space from one's home and health as well as life quality. In their analysis, they found out that Danes reported poorer health and life quality if they are living more than one kilometer away from a green space. Additionally, for those people it is more likely to experience stress in contrast to people living less than 300 m from a green space. Additionally, Maas et al. (2009) claim that less green spaces in the neighborhood are linked with feelings of loneliness and perceived shortage of social support.

Further, there are studies assessing the link between green spaces and health, but referring to the effects regarding physical activity as well. Barton, Hine and Pretty (2009) also analyzed the topic of green spaces but, in contrast to previous research, they tried to find an association between walking in green spaces with heritage value in the East of England and changes in self-esteem and mood. They made a pre-test before walking and a post-test after walking. They found out that after walking in green spaces, overall negative feelings decreased whereas self-esteem scores were significantly higher compared to the pre-test. Additionally, overall mood also improved significantly. This finding is supported by Barton and Pretty (2010). In their study, they found out that exercising in any green environment improved self-esteem and mood, and if there was water in the environment, the effect was even stronger. Richardson, Pearce, Mitchell, & Kingham (2013) investigated the relationship between green space and health by having a look at the role of physical activity. They found out that physical activity was higher in greener areas, and therefore people showed better general health. Similar findings were made by Lee and Maheswaran in 2011, who found a weak link between physical health, mental health, well-being and urban green space. They also concluded that accessibility of green spaces affects physical activity and therefore physical health. Takano, Nakamura and Watanabe (2002) findings support this hypothesis, too. Maas, Verheij, Groenewegen, de Vries, and Spreeuwenberg (2008) tried to examine whether physical activity could be an underlying mechanism in the association of green spaces in the neighbourhood and the

perception of health. The results show that there barely is a relationship between green spaces and the amount of physical activity. That is why the frequency of physical activity could not explain the association of green spaces and health. In contrast to that finding, Nutsford, Pearson, and Kingham (2013) found out that accessibility of green spaces also influences mental health. Findings of Van den Berg, Maas, Verheij, and Groenewegen (2010) support this connection. This would also match Ambrey and Fleming's (2014) results. Ambrey and Fleming (2014) showed that there is not only a connection between green spaces and health but also between life satisfaction and green spaces. Life satisfaction composed of age, marital status, big five, health conditions, employment status and income, such as living situation. They found out that green space function as a buffer against negative health impacts, like stressful life events. Other studies analyzing the same topic could find effects of sex. Reklaitiene et al. (2014) evaluated the relationship of green space, depressive symptoms and perceived general health in urban population. They found out that the association between use and proximity to green spaces and depressive symptoms as well as poor and very poor perceived general health could be confirmed for women only.

Ma (2014) tried to analyze the relationship between actual and perceived environment and also assessed active travel behavior. To assess active travel behavior, Ma (2014) examined the frequency of riding a bicycle. The results are a mismatch between the actual and the perceived environment and various factors (e.g. sociodemographic data, attitudes) which contribute to this. Furthermore, perceived environment and actual environment only had independent effects on bicycling. Most similar to the present research is a doctoral thesis written by Kruize (2007). In her thesis, Kruize also tried to investigate the relationship between the perceived environment and the actual environment in the Netherlands. Furthermore, Kruize considers the topic of environmental equity as another factor that could have an impact on the relationship of actual and perceived environment. Environmental equity means that no specific socio-economic group is affected by more negative environmental impacts (e.g. pollution) than another (Kruize, 2007). Referring to actual environmental quality, Kruize (2007) takes a look at noise indicators (e.g. road traffic noise and air traffic noise), air quality (NO_2) and the availability of public green spaces (e.g. parks and forests). The perceived environment is measured by the annoyance due to noise, malodor, dust or dirt and the satisfaction with public green spaces nearby. Additionally, socioeconomic data is collected to examine the level of environmental equity. Results show that education has an impact on the perception of the environment. Furthermore, people with higher education rather feel responsible for the

sustainability of their neighborhood than less educated people. Aside of that, if people are higher educated their attitudes towards developments in their neighborhood are more positive than lower educated people's attitudes. Additional conclusions Kuize (2007) draws out of her research are that, referring to traffic noise and NO₂, the actual environmental situation matches more often compared to the perceptions of the availability of green spaces. Results also show that for people with lower incomes, actual and perceived environment are slightly worse and the differences between the state and the perceptions are larger. De Vries, Verheij, Groenewegen, and Spreeuwenberg (2003) also focused on socioeconomic status in his analysis. De Vries et al. (2003) further states that the connection between living in a green environment and health is even stronger if you are living in an urban area than in a municipal one. They additionally concluded that the relationship would be stronger for people with lower education.

Only few studies were found which investigated the topic of air pollution. For instance, Welsch (2006) did a research about the correlation between air pollution and subjective well-being, operationalized as happiness. Welsch (2006) found out that air pollution is a strong predictor of subjective well-being.

As literature research shows, there is a connection between actual environmental quality and perceived environmental quality as well as actual environmental quality and perceived health (Wood et al., 2017; White et al., 2013). Based on the current state of research, it is obvious that most studies do not take into consideration environmental factors other than green spaces, when measuring the environmental quality, both actual and perceived. Only few focused on other environmental factors, such as air pollution and noise. There is only one study that combines several environmental factors when measuring perceived or actual environmental quality. For those reasons, the present study took further environmental factors into consideration. The research question approached to answer with this study is: How does the objectively measured environmental quality correspond to the perceived environmental quality and affect the health of Kamp-Lintfort's residents? This led to the following three hypotheses:

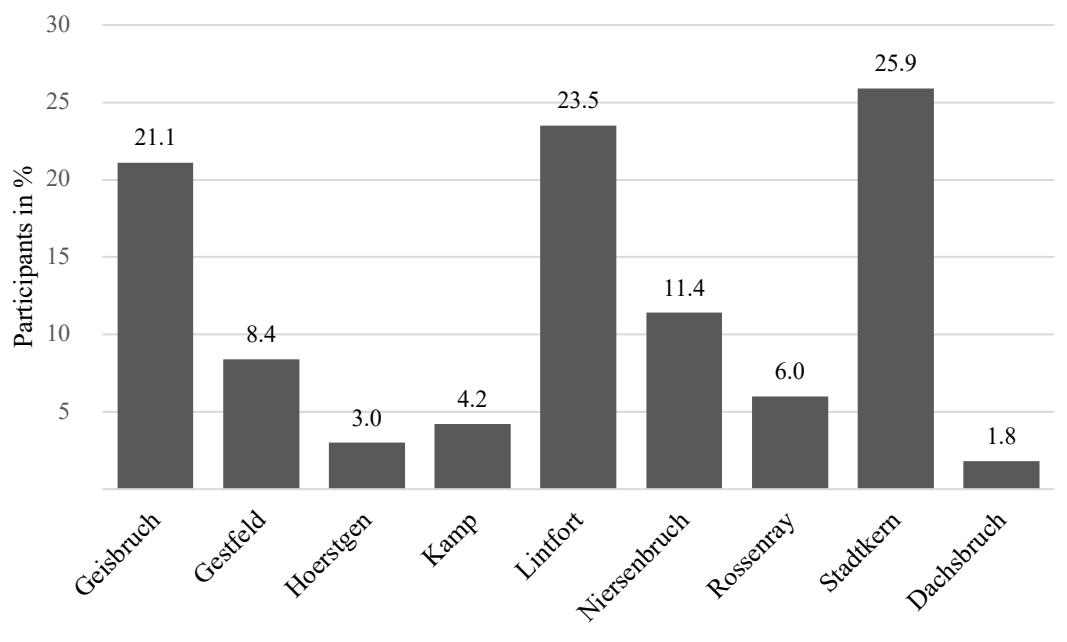
1. There is a mismatch between the perceived and the actual environmental quality in Kamp-Lintfort.
2. There is a relationship between the perceived environmental quality and the perceived health.
3. The relationship between the perceived environmental quality and the perceived health is moderated by the location where people live.

2 Method

2.1 Participants

The initial sample included 261 respondents, however, a total of 50 respondents did not fill out the questionnaire completely, resulting in their exclusion. After applying the relevant criteria for this study, eleven other participants denying the use of their data were excluded, reported in appendix A. In consideration of the valid questionnaires, 200 completed data sets remained. The sample included 81 men (40.50%) and 119 women (59.50%) who are, on average, 38.86 years old (range: 16-87). This distribution is not representative for Kamp-Lintfort's residents ($M = 44.34$; Stabsstelle Geoinformation, n.d.) as the present sample is significantly younger ($M = 38.86$, $SD = 14.55$, $t(199) = -5.33$; $p < .001$). The respondents were distinguished in residents and non-residents of Kamp-Lintfort, resulting in 166 people (83.00%) living in Kamp-Lintfort and 34 people (17.00%) being in Kamp-Lintfort at least once a week. Kamp-Lintfort's residents reported to have lived in this city for 28.20 years on average. Percentages based on urban districts are shown in figure 2.

Figure 2. Distribution of present sample considering Kamp-Lintfort's urban districts.



2.2 Material and Method

In order to collect data, a German questionnaire, to be seen in appendix B, consisting of 28 items was generated using a pre-test for validation. The participants were given the possibility to fill out the questionnaire either online or on paper. Both versions included a permission of data usage and granted them anonymity. The two versions did slightly

differ in form and content. The wording of the answers of the question “How do you perceive the disturbance caused by traffic during the day in Kamp-Lintfort?” differed between the online and the paper version. In the online version, the scale ranged from 1 = *very low* to 101 = *very high* whereas in the paper version, the scale was titled with 1 = *very poor* and 101 = *very good*. Furthermore, participants of the online version were not shown all items due to the use of filter questions whose answers influence the course of the questionnaire. This was for instance the case for the question of participants’ city of residence. If a respondent stated to live in Kamp-Lintfort, they were asked for how long and in which district they lived. If the respondent answered not to live in the city of interest, they were asked how often they spend time in the city. Thus, participants were only confronted with the necessary number of items.

The respondents to the survey were asked to provide answers to the items that assessed (1) perceived environmental quality, (2) perceived health, (3) control variables and (4) demographic data. Two additional questions concerning the *Landesgartenschau 2020* (“How do you estimate the *Landesgartenschau*’s influence on the environmental quality in Kamp-Lintfort?”) and the former coal mine in Kamp-Lintfort (“What or who influenced your opinion on the former coal mine in Kamp-Lintfort the most?”) were included for further studies. The various measures that were used on the survey are described as following.

2.2.1 Perceived Environmental Quality

In this study, perceived environmental quality consists of the factors tap water quality, groundwater quality, air quality, noise disturbance caused by traffic during day time and the amount of green spaces which all contribute to the quality of environment. These aspects were assessed using mainly one item each. The item for each relevant topic refers to the perception (e.g. “How do you perceive the tap water quality in Kamp-Lintfort?”). The participants’ rated their answers on a visual endpoint based analogue scale. The designation of the endpoints differed depending on the item. For tap water, groundwater and air the answers ranged from 1 = *very bad* to 101 = *very good*. To assess the noise disturbance caused by traffic (“How do you perceive the disturbance caused by traffic during the day in Kamp-Lintfort?”), the respondents should rate their answer from 1 = *very low* to 101 = *very high*. An exception was made to assess the amount of green spaces. For that purpose, the participants were asked a question concerning their satisfaction with the amount of green spaces in Kamp-Lintfort (“How content are you with the amount of green spaces in Kamp-Lintfort?”) in which the answers ranged from 1 = *very discontent* to 101 = *very content*. In addition to the item described before, the respondents should

estimate to which extent Kamp-Lintfort consists of green spaces (“What do you estimate is the amount of green spaces Kamp-Lintfort consists of?”) in which the answers ranged from 1 = 0% to 101 = 100%. Subsequent to individual ratings on the perception of tap water quality, groundwater quality, air quality, traffic noise disturbance and the amount of green spaces, the respondents had to choose the aspect with the most potential for improvement (“What do you think is the area with most room for improvement?”). The survey also included one item about Kamp-Lintfort’s point sources for environmental damage. The participants should rank the point sources traffic during the day, the *Eyller Berg*, the *Asdonkshof* and the former coal mine according to their potential for damage. An index of the perception of relevant environmental factors was formed but could not be used due to the low value of Cronbach’s alpha ($\alpha = .41$).

2.2.2 Perceived Health

The participants were asked to answer four items regarding their perceived health which was measured by rating their perceived health in general (“How do you rate your state of health in general?”), their perceived general health in comparison to other people of their age (“How would you rate your state of health in comparison to other people at your age?”), their perceived mental health (“How would you rate your mental state of health?”) and their perceived physical health (“How would you rate your physical state of health”?). Visual endpoint based analogue scales were used to assess the participants’ answers with a range from 1 = *very bad* to 101 = *very good*. An index of perceived health, including all four items, could be formed ($\alpha = .85$).

2.2.3 Control Variables

In addition to perceived environmental quality and health, several control items were assessed to examine further relations. These control items referred to the environmental consciousness (“How environmentally conscious do you rate yourself?”), the satisfaction to live in Kamp-Lintfort (“How much do you like to live in Kamp-Lintfort”), the participants’ moods (“How would you rate your current mood?”) and the participants’ stress levels (“How stressed out did you feel throughout the last seven days?”). The items were measured using visual endpoint based analogue scales. The designation of the endpoints differed depending on the items. In addition to that, the survey assessed the relevance of the factors contributing to environmental quality (i.e. tap water quality, groundwater quality, air quality, noise disturbance and the amount of green spaces) from the participants’ points of view (e.g. “How important is the air quality in Kamp-Lintfort for you?”). The endpoints of the visual analogue scales ranged from 1 = *not important at*

all to *101 = very important*. These items serve as control variables and could be used to form an index of perceived environmental relevance ($\alpha = .70$).

2.2.4 Demographic Data

The final section of the survey asked participants to fill out items regarding age, sex and the city of residence. If people lived in Kamp-Lintfort, they had to choose which district they live in and to report for how many years. If people lived in another city, they were asked how many times a week they spend time in Kamp-Lintfort ranging from *less than once a week* to *seven times a week*.

2.3 Procedure

In order to avoid informing participants of the specific research goals and hypotheses, the survey was posted with the intentionally vague title “Environmental questionnaire Kamp-Lintfort”. The online questionnaire was conducted via the website SoSciSurvey.de and the online survey period lasted from the November 22nd, 2018 until December 1st, 2018. In order to obtain as many respondents as possible, the link to participate was shared on several social media platforms in local groups. Once the respondents read the instruction on the first page and formally consented to the usage of their data by selecting *yes* as the answer, they were able to fill out further questions. The duration ranged from approximately five to ten minutes. Participants filling out the paper alternative, on the other hand, were recruited in the city center of Kamp-Lintfort at three different locations on November 29th, 2018. Therefore, random passersby were informed about the vague topic and the purpose of the survey being a university project. The following approach did not differ from the one of the online version, however, people needed more time to fill out the questionnaire on paper.

2.3.1 Description of Actual Data Collection and Analysis

The main goal of this section was to collect the actual environmental data such as air quality data, water data, noise data. For collecting those data, different approaches were taken for different quality data. Water data was collected directly from LINEG officials (Haatjans, H., personal communication, October 29th, 2018) and *Stadtwerke Kamp-Lintfort*. For air quality data, it was difficult to collect those data as there is no measurement station in Kamp-Lintfort. To overcome this problematic situation, it was decided to collect the air quality data from LANUV. Keeping Kamp-Lintfort at the center, the nearby cities Krefeld, Duisburg and Wesel were chosen for the data collection. After

calculating an average value, the actual air quality data of Kamp-Lintfort was generated. The noise map was collected from *NRW Umweltdaten vor Ort* (UVO; NRW Umweltdaten vor Ort, 2017).

2.3.2 Description of the Perceived Environmental Quality Index

As the datasets for actual and perceived environmental quality were not available on the same data level, the research group had to figure out a way to be able to compare the actual and perceived environmental quality. In order to do so, some research on already existing indices for categorization of environmental data was done. It was decided to adapt the scheme of the *European Air Quality Index* (EAQI) by the European Environment Agency (2018). The EAQI divides the air quality within Europe into five colored categories which use different threshold values for each pollutant in order to determine the index level as shown in table 1. For the present study, the *Perceived Environmental Quality Index* (PEQI) was created using the adapted coding scheme of the EAQI. Each pollutant was divided into five categories ranging from *very poor* to *very good* according to their valid threshold values. Setting up the categories started with the threshold values as being located between the categories *moderate* and *poor*. The upper

Table 1. The European Air Quality Index.

Pollutant	Index level (based on pollutant concentrations in µg/m³)				
	Good	Fair	Moderate	Poor	Very poor
Particles less than 2.5 µm (PM _{2.5})	0-10	10-20	20-25	25-50	50-800
Particles less than 10 µm (PM ₁₀)	0-20	20-35	35-50	50-100	100-1200
Nitrogen dioxide (NO ₂)	0-40	40-100	100-200	200-400	400-1000
Ozone (O ₃)	0-80	80-120	120-180	180-240	240-600
Sulphur dioxide (SO ₂)	0-100	100-200	200-350	350-500	500-1250

Notes. Source: European Environment Agency (2018).

limit of the category *poor* was set by doubling the threshold value and *very poor* was everything beyond. As for the perceived data, which were measured on a scale ranging from 1 = *very poor* to 101 = *very good*, the following categorization was made. Based on the actual threshold value being located between the categories *moderate* and *poor*, and the fact that the questionnaire measures are bipolar with a kind of neutral category in their middle (51), the division was made from the scale value 51 as an equivalent for the threshold value. This leads to the color coding scheme as displayed in table 2. Values which are worse than the threshold value were divided into two equally distant categories below the scale value 51. Values which are better than the threshold value, thus, exceed

Table 2. Categories of the PEQI for the questionnaire data.

Very poor	Poor	Moderate	Fair	Very Good
1 – 26	27 – 51	52 – 62	63 – 83	84 – 101

the scale value 51, were divided into three categories. As the values round about the threshold value are more important for classification between good and bad, the category was chosen to be smaller. Going further to the endpoint, the two categories were equally divided.

2.4 Description of the Statistical Methods for the Survey Data

After the termination of the survey, the questionnaire data collected was tested for statistical requirements in order to decide whether or not parametric methods could be applied. In order to test the hypotheses, different methods of inferential statistics were used. All the significance tests are two-tailed assuming a significance level of .05 (Bühner, 2011). Table 3 gives an overview of all metric items' bivariate correlations.

Using SPSS 24, Spearman's rank-order correlations, Pearson correlations and *t*-tests were computed. Including the macro PROCESS v2.16.3 by Hayes (2012), the hypothesized moderating effect of the urban district Kamp-Lintfort's residents live in on the correlation between perceived environmental quality and perceived health could be tested. Therefore, as a first step, a regression analysis was conducted with the respective item of perceived environmental quality (i.e. tap water, groundwater, air, traffic noise and green spaces) as the predictor variable and the perceived health as the criterion variable. Second, the hypothesized moderator variable *urban district* was included.

Table 3. Bivariate correlations between all the items concerning perception, the environmental importance, self-ratings of mood and health as well as age and living in Kamp-Lintfort.

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
1. Perception tap water	—	.149*	.402**	.425**	.053	.371**	.194**	.130	.053	.041	.200**	.166*	.163*	.190**	.049	.295**	-.135	.292**	.305**	.235**	.192**	.255**	-.056	.129	.170*		
2. Importance tap water	.149*	—	.201**	.075	.296**	.157*	.483**	.081	.213**	.079	.012	.352**	.608**	.079	.047	.144*	-.084	.117	.104	.123	.105	.056	.140*	.054	.065		
3. Drinking tap water	.442**	.201**	—	.258**	.037	.264**	.231**	.033	.173*	.082	.052	.259**	.252**	.156*	.186**	.287**	-.112	.106	.151*	.049	.061	.105	.138	.176*	.138		
4. Percept. ground water	.425**	.075	.288*	—	.216**	.371**	.092	-.080	.193**	.004	.046	.015	.186**	.182*	.078	.175*	-.114	.269**	.233**	.229**	.098	.299**	-.105	.011	.099		
5. Import. ground water	.053	.296**	.037	.216**	—	.181*	—	.290**	.102	.014	.091	.239*	.141*	.204**	.198**	.134	.202**	.185**	.340**	.269**	.341**	.249**	.274**	.171*	.181*	.234**	
6. Perception air	.371**	.157*	.264**	.371**	.181*	—	.479**	.209**	—	.053	.290**	.091	.028	.434**	.729**	.093	.241**	.261*	-.086	.115	.138	.082	.126	.039	.099	.132	.119
7. Importance air	.194*	.483**	.231**	.092	.479**	.290**	—	—	—	.321**	.037	.111	.141*	.143*	.026	-.002	.010	-.027	-.024	-.005	-.051	.020	-.045	-.002	.127	.045	
8. Perception traffic noise	.130	.081	-.033	-.080	-.020	.102	.053	—	—	—	.321**	.037	.111	.141*	.143*	.026	-.002	-.010	-.027	-.024	-.005	-.051	.020	-.045	-.002	.127	.045
9. Importance traffic noise	.053	.213**	.173*	.193*	.276**	.014	.290**	.321**	—	—	.074	-.012	.306**	.711**	.080	.284**	.150*	-.056	.040	.011	.084	.036	-.003	.237**	.164*	-.117	
10. Guessing green spaces	.041	.029	.082	.004	.097	.091	.037	.074	—	—	.406**	.149*	.129	.132	.025	.099	-.134	.031	.008	.056	.041	-.009	.217**	.221**	.166*		
11. Percep. green spaces	.200**	.012	.052	.046	.157*	.239**	.028	.111	-.012	.406**	—	-.051	.038	.334**	.013	.089	-.095	.249**	.182**	.262**	.185**	.199**	.158*	.134	.251		
12. Import. green spaces	.166*	.352**	.259*	.015	.311**	.141*	.434**	.141*	.396**	.149*	—	-.051	—	.714**	.060	.283**	.282**	-.138	.080	.047	.091	.124	-.006	.286**	.286**	.057	
13. Index importance	.163*	.608**	.252**	.186**	.683**	.204**	.729**	.143*	.711**	.129	.038	.714**	—	.084	.324**	.265**	-.075	.114	.080	.133	.127	.029	.274**	.217**	.022		
14. Influence LaGa	.190**	-.029	.156*	.182*	.065	.198**	.093	.026	.080	.132	.334**	.060	.084	—	.183**	.115	.118	.191**	.139	.178*	.147*	.172*	.120	.000	.287**		
15. Fav. consciousness	.049	.047	.186*	.078	.207**	.134	.241*	-.002	.284**	.025	.013	.283**	.324**	.183**	—	.321**	-.128	.157*	.114	.159*	.154*	.091	.324**	.147	.190**		
16. Current mood	.295**	.144*	.267*	.175*	.105	.202*	.261*	-.10	.150*	.099	.089	.282*	.265*	.115	.321**	—	.388*	.440*	.420*	.400*	.278*	.490*	.281*	.127	.174*	.293**	
17. Stress last 7 days	-.135	-.084	-.112	-.114	.080	-.185**	-.086	-.027	-.056	-.134	-.095	-.138	-.075	-.118	-.128	-.388*	—	—	-.402**	-.320**	—	-.432**	-.277**	-.200**	-.144	-.016	
18. Index perceived health	.392**	.117	.106	.269**	.072	.340**	.115	-.024	.040	.031	.249*	.080	.114	.191**	.157*	.440*	—	.402**	—	.874**	.872**	—	.692**	.535**	.739**	-.097	.041
19. General health	.305**	.104	.151*	.293**	.022	.269**	.138	-.005	.011	.008	.182*	.047	.080	.139	.114	.420*	—	.320**	.874**	—	.692**	—	.541**	.669**	.839*	.041	.131
20. Health comp. to others	.235**	.123	.049	.229**	.091	.341**	.082	-.051	.084	.056	.262**	.091	.133	.178*	.159*	.278*	—	.305**	.872**	—	.604**	—	.604**	.669*	.166*	.224**	.050
21. Psychical health	.192**	.105	.061	.098	.083	.249**	.126	.020	.036	.041	.185**	.124	.127	.147*	.154*	.490*	—	.432**	.764**	.535**	.541**	—	.436**	.436*	.130	.129	.096
22. Physical health	.255**	.056	.105	.299**	.035	.274**	.039	-.045	-.003	-.009	.199*	-.006	.029	.172*	.091	.281**	—	.277**	.839**	.739**	.669**	.436*	—	—	-.100	.064	.003
23. Age	-.056	.140*	.138	-.105	.149*	.171*	.099	-.002	.237**	.217**	.158*	.286*	.274**	.120	.324**	.127	—	.200**	.041	.097	.166*	.130	-.100	—	.604**	.210**	
24. Years living in Ka-Li	.129	.054	.176*	-.011	.110	.181*	.132	.127	.164*	.221**	.134	.286**	.217**	.000	.147	.174*	—	.144	.131	.001	.224**	.129	.064	.604**	—	.236**	
25. Liking to be in Ka-Li	.170*	.065	.138	.099	.034	.234**	.119	.045	.117	.166*	.251**	.057	.022	.287**	.190*	.293**	-.016	.068	.076	.050	.096	.003	.210**	.256*	—		

Notes. The index importance consists of items 2, 5, 7, 9 and 12. The index perceived health consists of items 19, 20, 21 and 22. * $p < .05$, ** $p < .01$.

3 Results

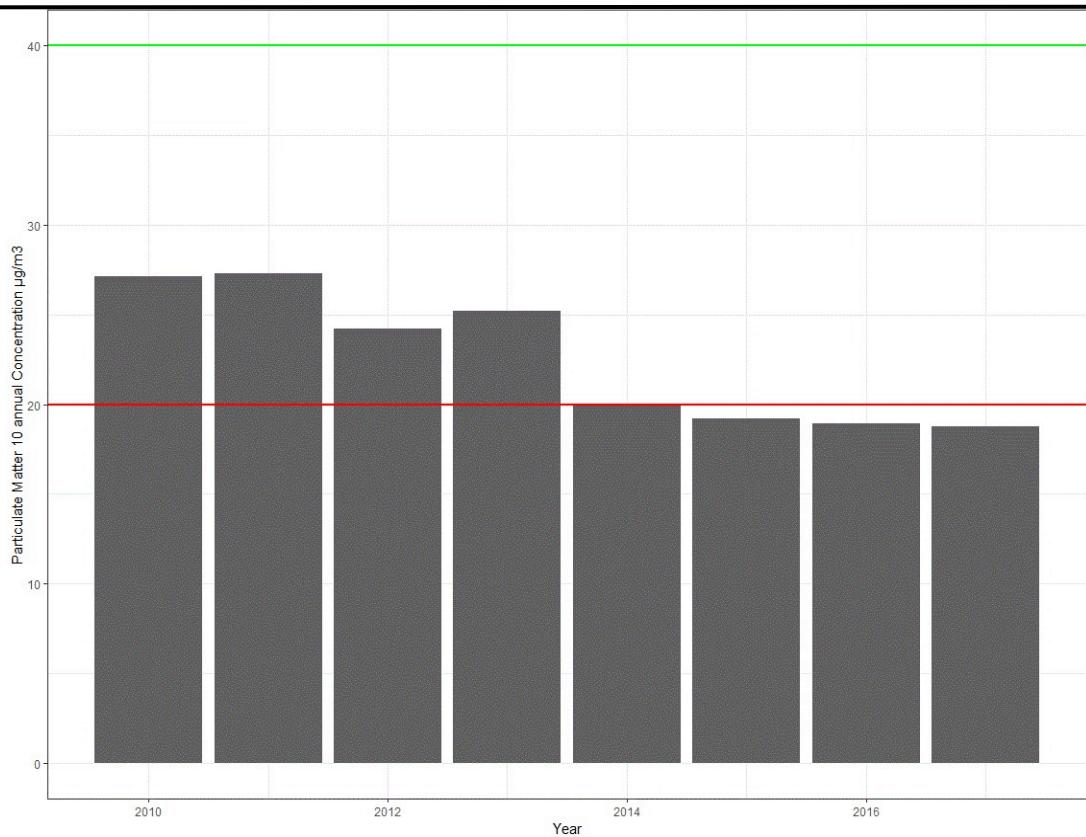
3.1 Assessment of the Actual Environmental Quality in Kamp-Lintfort

To assess the quality of the actual environment in Kamp-Lintfort, data of the different media were retrieved and then compared to the limit values. A combination of all the media is not possible so that the quality of each component was discussed separately.

3.1.1 Air Quality

To analyze the air quality data, *World Health Organization* (WHO) and *European Union* (EU) threshold values, to be seen in appendix C1 were taken under consideration. PM10, NO₂, SO₂ and O₃ are the substances collected and measured. The annual concentration of PM10 in Kamp-Lintfort from 2010 to 2017 are displayed in figure 3. It is visible that the concentration threshold values are under the EU threshold values over the past few years. Although the concentration had exceeded the WHO limit values from 2010 to 2013, it began to decrease after 2013 and since then it has been under the WHO threshold value. In conclusion, the current concentration of PM10 in Kamp-Lintfort can be assessed as good.

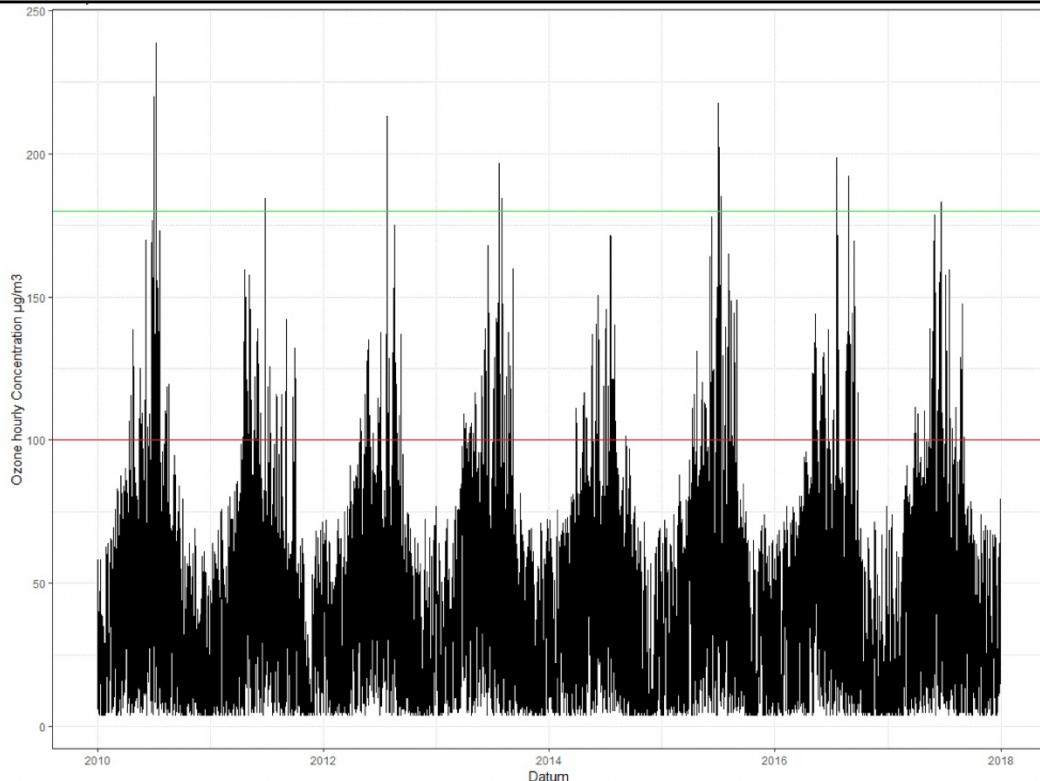
Figure 3. Particulate Matter 10 concentration in Kamp-Lintfort.



Notes. EU limit values are green and WHO limit values are red.

Figure 4 shows the daily 8-hours concentration of ozone in Kamp-Lintfort from 2009 to 2017. The threshold value for ozone concentration is $120 \mu\text{g}/\text{m}^3$. It is visible that the concentration of the ozone gas is high in summer time and it decreases as the weather gets colder. In summer, the concentration sometimes exceeds the EU threshold value. But again, with the change of the weather, the concentration decreases over time. In conclusion, the current concentration of ozone in Kamp-Lintfort can be assessed as good because the mean values do not exceed the threshold value when averaging over the year.

Figure 4. 8-hours ozone concentration in Kamp-Lintfort.

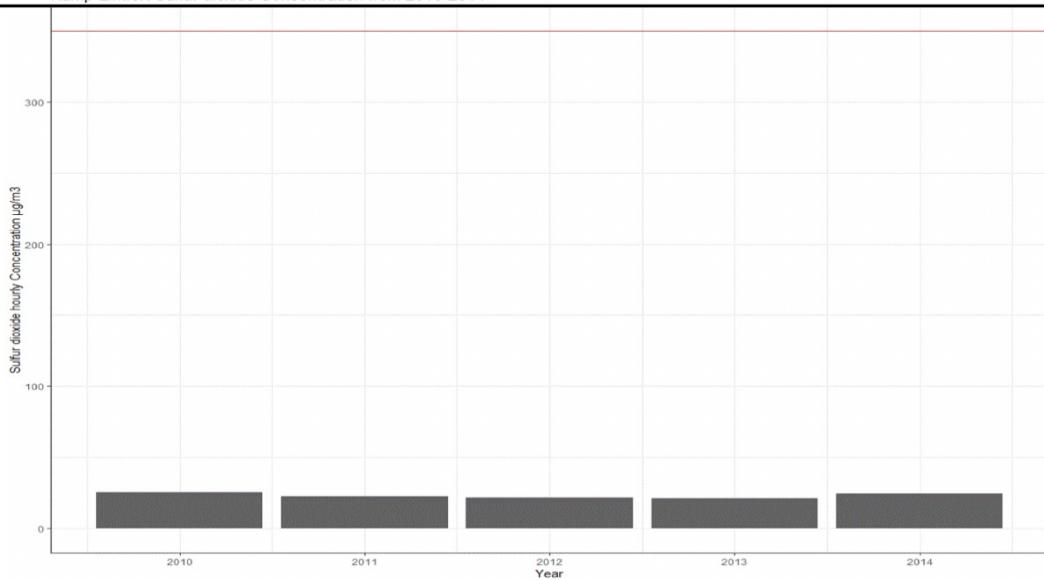


Notes. EU limit values are green and WHO limit values are red.

Figure 5 shows the hourly concentration of sulfur dioxide from 2010 to 2014. Over the past few years, the concentration of the sulfur dioxide gas is way below the threshold value of EU threshold value. Thus, further measurements were concluded as unnecessary and ended in 2014. In conclusion, the current concentration of sulfur dioxide in Kamp-Lintfort can be assessed as good.

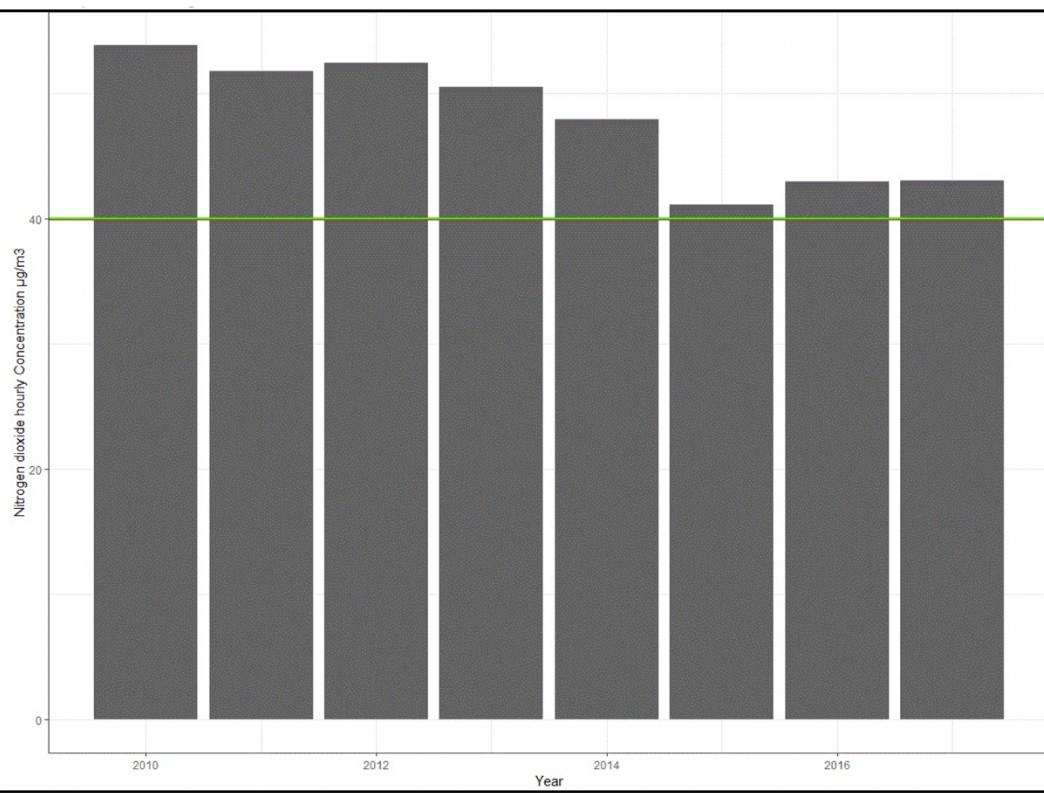
Figure 6 shows the hourly concentration of nitrogen dioxide in Kamp-Lintfort from 2010 to 2017. The threshold values for both EU and WHO is $40 \mu\text{g}/\text{m}^3$ and over the past few years, the concentration of nitrogen dioxide has exceeded both EU and WHO threshold values. In conclusion, the current concentration of NO_2 in Kamp-Lintfort can be assessed as bad.

Figure 5. Sulfur dioxide hourly concentration in Kamp-Lintfort.



Notes. Red line visualizes limit value.

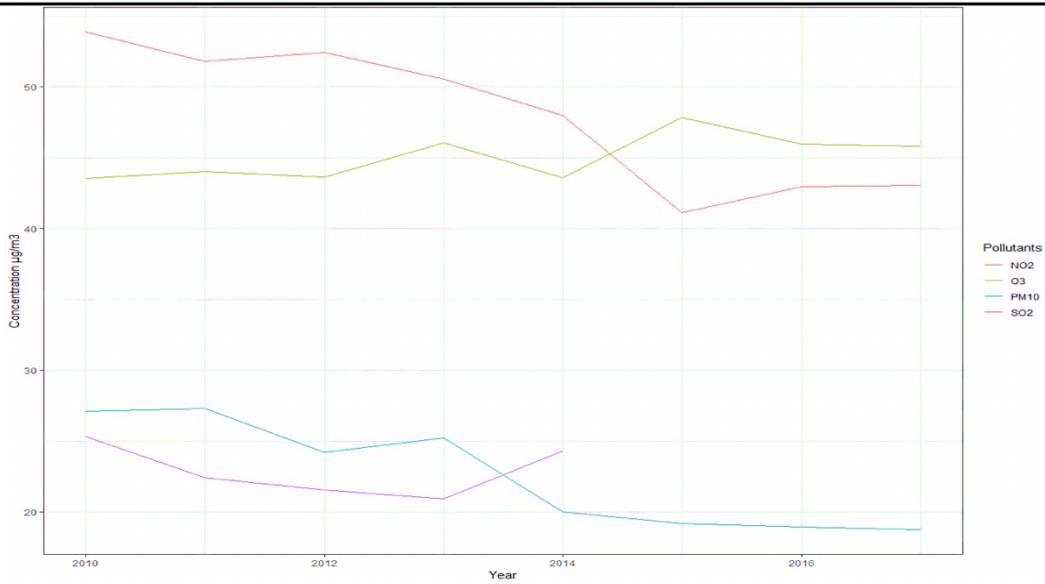
Figure 6. Nitrogen dioxide concentration in Kamp-Lintfort.



Notes. EU limit values are green and WHO limit values are red.

A general overview of PM10, NO₂, SO₂, O₃ concentration from 2010 to 2017 is displayed in figure 7. The concentration of all those gas substances have decreased over the past few years and the overall result can be evaluated as good. It is safe to assume that the concentration of those gases are still under control and at satisfactory levels.

Figure 7. Overview of pollutants in Kamp-Lintfort's air.



3.1.2 Water Quality

For assessing water quality, both groundwater and tap water were under consideration and analyzed comparing them with the WHO and EU standard limit values. Table 4 displays the water substances and the limit values of the EU and WHO. As can be seen, the different systems of threshold limits cannot be compared because different parameters are taken as important to assess the tap water quality. The EU tap water limits have to be applied to guarantee the tap water quality in Kamp-Lintfort. Considering figure 8, comparing the actual values, indicated as blue, to the orange bars, representing the EU limit values, the actual values are in accordance with regulations which indicates that the tap water quality in Kamp-Lintfort is good.

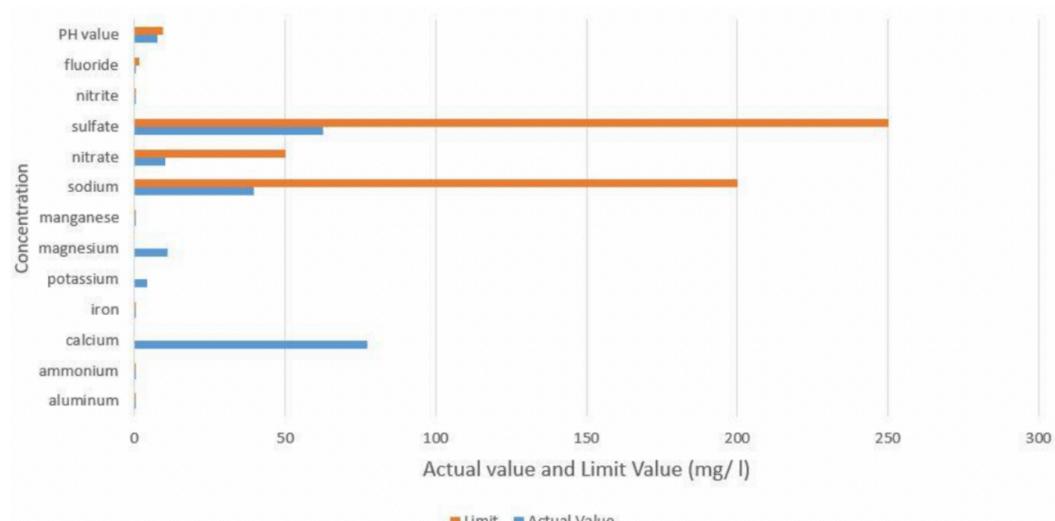
Figure 9 shows the nitrate concentration of groundwater in Kamp-Lintfort in current recent years. Nitrate is among the substances which is dangerous to health if it exceeds a certain limit it was therefore chosen as indicator for the groundwater quality. For EU, the threshold limit is 50 mg/l. Over the past few years, the nitrate concentration has always been under the limit value although it almost reached the EU threshold value in May 2017 and in June 2018. The overall nitrate concentration is around 30 mg/l which is below the limit value of 50 mg/l which means that the assessment can be described as good.

Table 4. Comparing different indices for tap water with actual tap water quality in Kamp-Lintfort.

Substances	Drinking water values in mg/l	Limits for EU in mg/l	Limit values for WHO in mg/l
Aluminum	0.01	0.2	No established guideline value
Ammonium	0.02	0.5	No established guideline value
Calcium	77.40	-	No established guideline value
Iron	0.01	0.2	No established guideline value
Potassium	4.06	-	No established guideline value
Magnesium	10.90	-	No established guideline value
Manganese	0.01	0.05	No established guideline value
Sodium	39.50	200	No established guideline value
Nitrate	10.10	50	50
Sulfate	62.60	250	No established guideline value
Nitrite	0.02	0.5	3
Fluoride	-	1.5	1.5
pH Value	7.59	6.5-9.5	No established guideline value

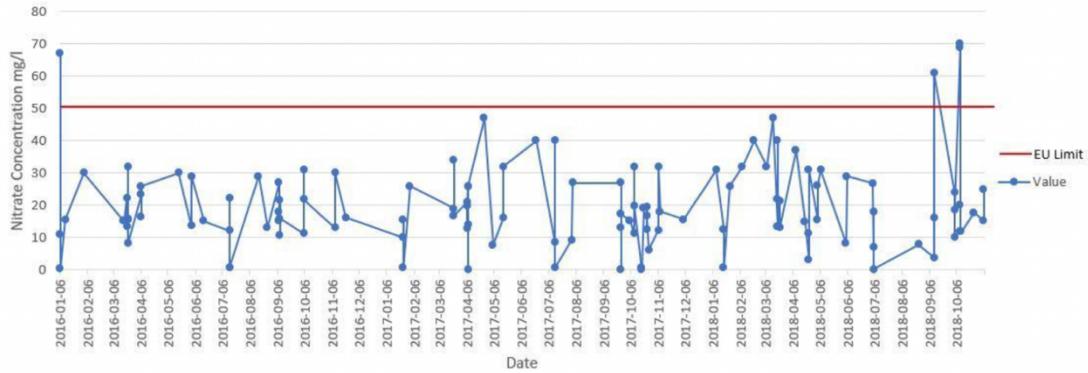
Notes. Source: Stadtwerke Kamp-Lintfort (2012); European Commission (n.d.); World Health Organization (n.d.).

Figure 8. Tap water quality in Kamp-Lintfort in January 2018



Notes. Blue bars indicate actual value, orange bars represent EU limit values.

Figure 9. Groundwater nitrate concentration in Kamp-Lintfort.



Notes. Blue lines and dots indicate actual values, red line shows EU limit value.

3.1.3 Traffic Noise

The data set for noise was retrieved in form the map displayed in figure 10 provided by NRW UVO (NRW Umweltdaten vor Ort, 2017) which collects and visualizes different data sets. In this map, it can be seen that the noise is visualized in different colors with purple and red being high noise pollution, yellow and green being an indicator for low noise pollution. Very or no noise is not displayed in the map. Thus, the noise is very high only in the outskirts of the city at the highways A42 and A57 which are not adjacent to the city center. The other areas indicated with red are the main roads of Kamp-Lintfort which cross the city. Aside from those roads, there are no important sources of noise.

Figure 10. 24-hours noise map of Kamp-Lintfort.



Notes. Source: NRW Umweltdaten vor Ort (2017).

3.1.4 Green spaces

The municipality of Kamp-Lintfort covers an area of 63.12 km² of which 13.56 km² are forest area and 19.60 km² agricultural land. This leads to a percentage of 52.53% of green spaces in Kamp-Lintfort. Another data set received from the *Grünflächenamt* (Hucklenbroich, D., personal communication, November 29th, 2018) reports the area of green spaces in the city of Kamp-Lintfort. The city therefore consists of 1.356.123 m² forest areas, 605.000 m² lawn, unused land and woodlands and 196.019 m² arable land (Hucklenbroich, D., personal communication, November 29th, 2018).

3.2 Perception of Kamp-Lintfort's Environmental Quality

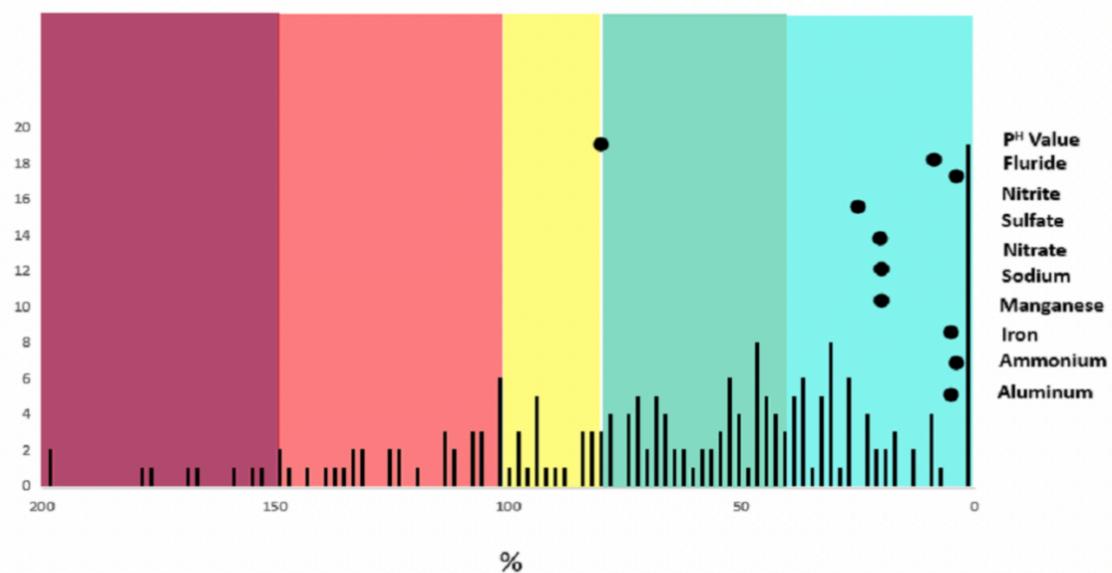
Table D1 in the appendix shows the mean ratings for the perceived environmental quality on a single item level. All the means vary between 54.65 ($SD = 23.42$) for groundwater quality and 69.35 ($SD = 22.61$) for tap water quality. This means that the perception of Kamp-Lintfort's environmental quality is quite in the middle of the scales which range from 1 = *very poor* to 101 = *very good*. As for the green spaces, the present sample guesses that 48.31% of Kamp-Lintfort consists of green spaces. Despite the perception that almost half of the city is green spaces, people rated their contentment with the amount of green spaces with only 55.83 ($SD = 22.97$).

3.3 Comparing the Actual and Perceived Environmental Quality

As the datasets could not be summarized with an index for actual and perceived environmental quality, respectively, statistical significance tests could not be used for comparison. Therefore, it was decided to use the PEQI in order to compare actual and perceived environmental quality in one diagram. Each diagram is highlighted in the five colors used in the PEQI from dark red = *very poor* to light turquoise = *very good*. The bars represent the survey participants' perceptions of the environmental quality of Kamp-Lintfort in the respective category (i.e. tap water, groundwater, air and traffic noise). Higher bars mean a higher frequency of people answering in the respective category from 1 = *very poor* to 101 = *very good*. Furthermore, the different values of the actual environmental quality are displayed. Additionally, the change over time can be retraced as the values for several years are included as well. Figure 11 shows the results for tap water quality, figure 12 shows the results for groundwater quality and figure 13 shows the results for air quality. As figure 11 shows, the values for tap water quality assessed by the PEQI can be categorized as *very good*. Only the pH value is slightly alkaline but

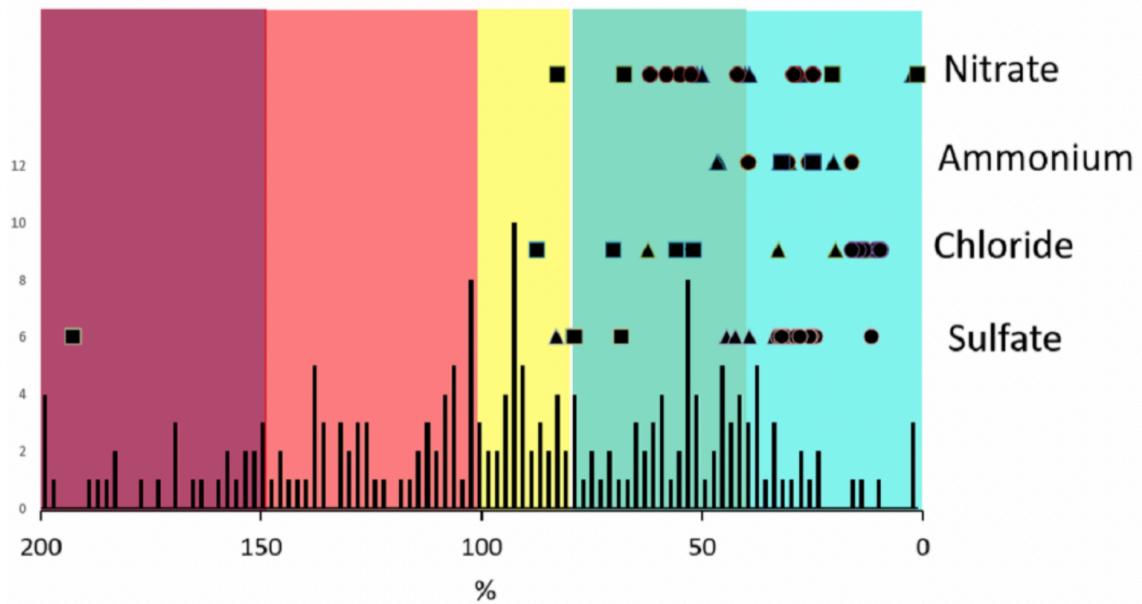
does not exceed the limits. The mean of perceived quality for drinking water is 69.35, and thus declared as *fair*. Figure 12 visualizes the PEQI for groundwater. As nitrate was taken as indicator for groundwater quality, the general quality of groundwater using PEQI is assumed to be *fair* with sites of past mining activities having the best and worst content of nitrate. The mean of perceived groundwater quality is 54.65, and thus referred to as *moderate*. Figure 13 shows the PEQI visualization of the air quality in Kamp-Lintfort. All values in 2017 are visualized by the streak (—) are in the *fair* to *very good* category considering the regulations except for NO₂. Over all, the classification of actual air quality is *fair* which is in contrast to the perceived air quality. The mean of perceived air quality is 68.86, and thus declared as *fair*. Considering green spaces, the actual and the perceived percentages of the extent to which Kamp-Lintfort exists of green spaces was compared using a one sample *t*-test. For testing, the percentage of 52.53% of Kamp-Lintfort being green spaces was transferred to the value 53.53 according to the scale from 1 to 101. The perception of the amount of green spaces $x = 49.31$ is significantly less than the actual amount of green spaces in Kamp-Lintfort ($\mu = 53.53$, $t(199) = -3.00$; $p = .003$). In conclusion, the hypothesis that there is a mismatch between the actual and the perceived environmental quality in Kamp-Lintfort could be confirmed.

Figure 11. PEQI visualization of tap water quality in Kamp-Lintfort.



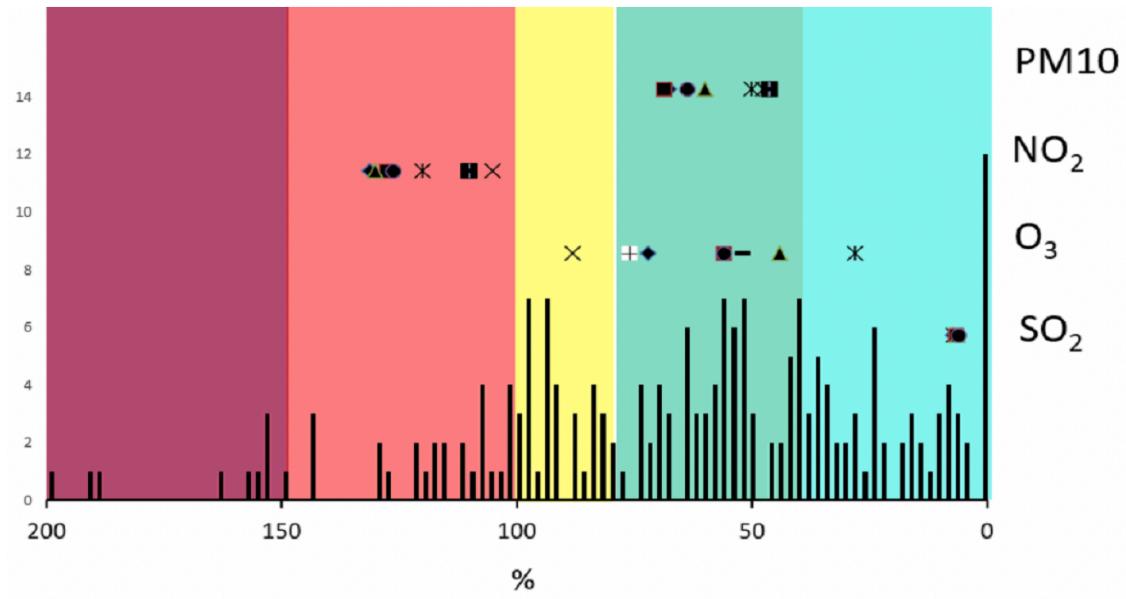
Notes. Perceived quality (columns): number of answers for each quality level from very bad (left side) to very good (right side). Actual quality (symbols): Concentration of Aluminium, Ammonium, Iron, Manganese, Sodium, Nitrate, Sulfate, Nitrite, Fluoride and pH value in tap water given as a percentage of the limit values set by the German Trinkwasserordnung. Mean values for concentration (activity) is given. Source: Trinkwasserverordnung Kamp-Lintfort.

Figure 12. PEQI visualization of groundwater quality in Kamp-Lintfort.



Notes. Perceived quality (columns): number of answers for each quality level from very bad (left side) to very good (right side). Actual quality (symbols): Concentration of NO_3 , NH_4 , Cl^- and SO_4^{2-} in groundwater given as a percentage of the limit values set by the German Grundwasserverordnung. Mean values for urban sampling sites (triangles), rural sites (dots) and sites influenced by mining activities (squares) are given. Source: LINEG.

Figure 13. PEQI visualization of air quality in Kamp-Lintfort.



Notes. Perceived quality (columns): number of answers for each quality level from very bad (left side) to very good (right side). Actual Quality (symbols): Concentration of Particulate Matter (PM10), Nitrogen dioxide (NO_2), Ozone (O_3) and Sulfur dioxide (SO_2) in ambient air as a percentage of limit values set by European legislation. For ozone, the number of days on which the 8h mean exceeds the target value of $120\mu\text{g}/\text{m}^3$ is related to the threshold of 25 days, for the other gases, the annual mean is related to the limit values (PM10: $40\mu\text{g}/\text{m}^3$; NO_2 : $40\mu\text{g}/\text{m}^3$; SO_2 : $350\mu\text{g}/\text{m}^3$). Means calculated for Kamp-Lintfort as an average of 1-hour data published for Wesel, Krefeld and Duisburg by LANUV are given for 2010 (◆), 2011 (■), 2012 (▲), 2013 (●), 2014 (*), 2015 (x), 2016 (+) and 2017 (-).

3.4 Testing the Correlation between Perceived Environmental Quality and Perceived Health

In order to test hypothesis 2 which states that there is a correlation between the perceived environmental quality and the perceived health, Pearson's correlations were determined. The correlation results provide support for the hypothesis. More precisely, significant positive correlations with the index for perceived health range from $r = .25$ to $r = .34$ which equates to a moderate strength. The index for perceived health significantly correlates with the perceptions of tap water quality ($r = .29$), groundwater quality ($r = .27$), air quality ($r = .34$) and the satisfaction with green spaces ($r = .25$, $p < .001$ respectively), however, there is no significant correlation with the perception of traffic noise ($r = -.02$, $p = .73$). As four out of five possible correlations reached statistical significance, the research team considers the hypothesis, with exception of traffic noise, as having withstood the falsification.

3.5 Testing the Moderation Effect of the Urban District

Building up on the significant correlations between the perceived health and environmental perceptions, the hypothesis stating the urban district which Kamp-Lintfort's residents live in to have a moderating effect on these correlations could be tested. Further testing with traffic noise was unnecessary as no significant correlation with perceived health was found. Testing for the presumed model, no significant moderating effects were found. The urban district did neither have a moderating effect on perceived tap water quality ($\beta = -.03$, 95% CI [-0.06, 0.01]), groundwater quality ($\beta = -.01$, 95% CI [-0.05, 0.03]), air quality ($\beta = -.02$, 95% CI [-0.06, 0.02]) nor on the perception of green spaces ($\beta = -.03$, 95% CI [-0.07, 0.01]).

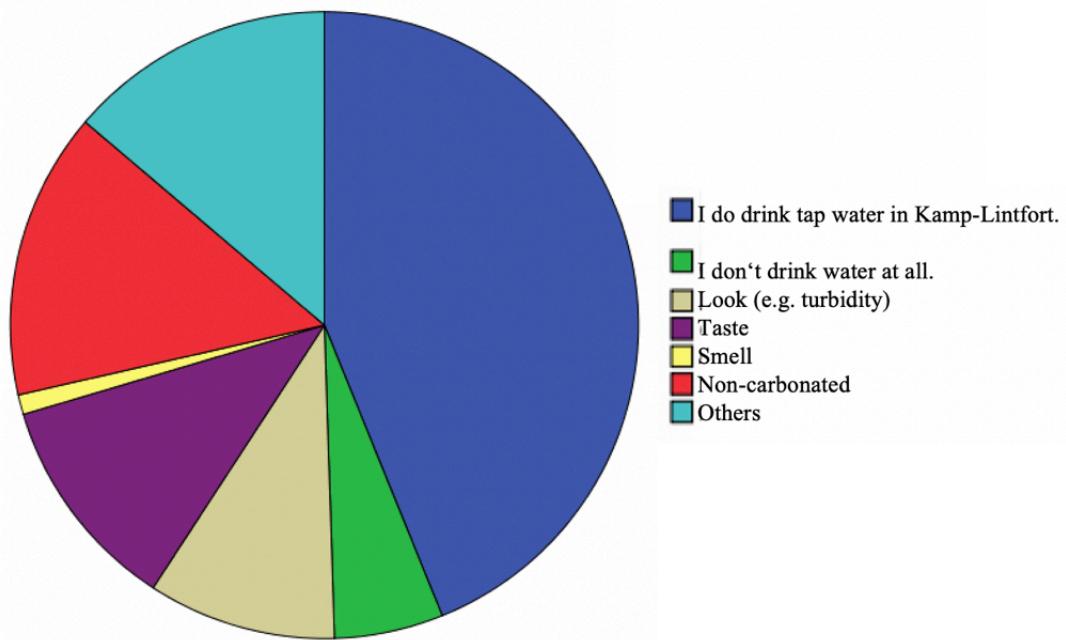
3.6 Further Results

Additional to testing the hypotheses, the researchers were interested in some questions they thought could help them understand the answers given in the questionnaire. In order to find out how aware people are of environmental issues in their place of residence, two control variables were included. First, the environmental consciousness was directly asked for. The participants rated themselves with $M = 69.82$ which equals being rather conscious. Second, a ranking task was included. Participants should rank the four point sources traffic noise, *Eyller Berg*, *Asdonkshof* and the former coal mine according to the amount of which they harm the environment in Kamp-Lintfort. According to the modes of the answers' frequencies, the following rank order was established. The point source

harming the environment most is the *Eyller Berg*. The *Asdonkshof* and traffic noise share the second place. The former coal mine was ranked on the last rank.

Another question concerned participants' reasons for not drinking tap water. Indeed, most of the participants, i.e. 43.00% of the present sample, drink tap water in Kamp-Lintfort. The most popular reason to not drink tap water is non-carbonation (14.50%), followed by *other reasons* on the second place (13.50%) and its taste on the third place (11.00%). All the answers are shown in figure 14.

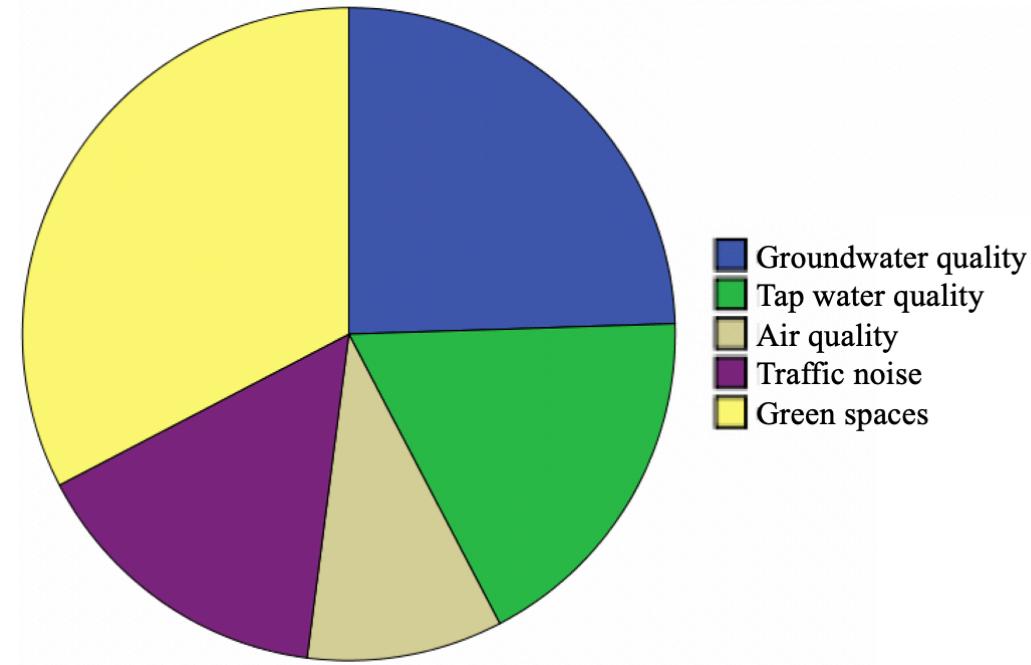
Figure 14. Reasons for not drinking tap water.



Notes. Source: own questionnaire.

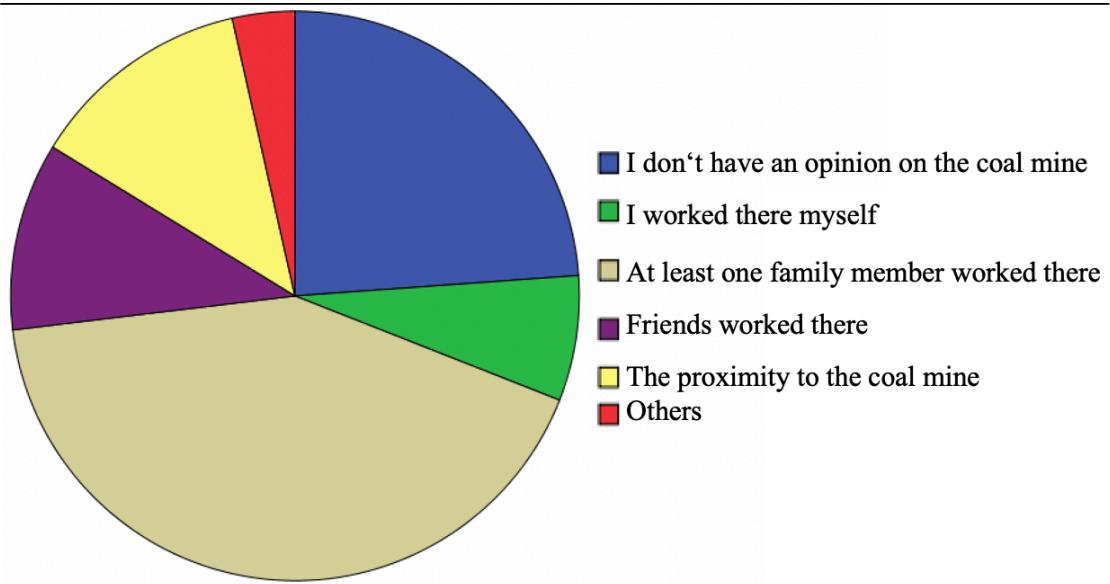
In order to get to know where people in Kamp-Lintfort see the biggest environmental need to improve, the research team included a corresponding question. Almost one third of the sample (32.00%) stated that green spaces provide the most potential for improvement, to be seen in figure 15. For 24.50% of the present sample, the groundwater quality should be improved and only 9.50% believe that the air quality has the biggest potential for improvement. Additionally, the questionnaire contained a question regarding the influence of the LaGa which will take place in Kamp-Lintfort. The mean of this rating was 62.05 ($SD = 24.88$) on a scale ranging from 1 = *very poor* to 101 = *very good*. Considering the item addressing the opinion on the former coal mine in Kamp-Lintfort, most people's (42.50%) opinions were influenced by at least one family member working there. Figure 16 also shows that 23.50% of the present sample stated that they do not have an opinion on the former coal mine.

Figure 15. Most potential for improvement in Kamp-Lintfort.



Notes. Source: own questionnaire.

Figure 16. Reasons which affected the opinion on the former coal mine.



Notes. Source: own questionnaire.

As the sample consists of both residents and non-residents from Kamp-Lintfort who took part in the survey by participating online or by filling in the paper version of the questionnaire, possible differences within the categories *place of residence* and way of *participation* were examined. Comparing people who live in Kamp-Lintfort ($N = 166$) and people who do not live in Kamp-Lintfort ($N = 34$), no significant differences in the perceptions of tap water quality ($t(198) = -0.93; p = .35$), groundwater quality ($t(198) = -1.59; p = .11$), air quality ($t(198) = 0.29; p = .77$), traffic noise ($t(198) = 0.83; p = .41$),

the satisfaction with green spaces ($t(198) = 1.04; p = .30$) and the importance of the environment ($t(198) = 0.47; p = .64$) were found. Significant differences could only be found considering age ($t(198) = 3.76; p < .001$), whereby people living in Kamp-Lintfort are older ($M = 40.25$) than people not living in Kamp-Lintfort ($M = 32.03$), and liking to be in Kamp-Lintfort ($t(198) = 4.39; p < .001$), whereby people living in Kamp-Lintfort like being there more ($M = 77.17$) than people not living there ($M = 56.21$). As for the different types of participation in the survey, i.e. online and paper version, two significant differences in answering behavior could be found. In the paper version, people perceive more traffic noise in Kamp-Lintfort ($N = 35; M = 69.09$) than in the online version ($N = 165; M = 52.52, t(198) = -3.30; p = .001$). However, participants from the online survey like being in Kamp-Lintfort more ($N = 165; M = 76.25$) than in the people who took part in the paper version ($N = 35; M = 61.14, t(198) = 2.66; p = .01$). Furthermore, the differences in the ratings of environmental consciousness and liking to drink tap water are marginally significant. In the paper version, people like drinking tap water in Kamp-Lintfort more ($N = 35; M = 67.17$) than in the online version ($N = 165; M = 55.99, t(198) = -1.87; p = .06$). As for the environmental consciousness, the ratings in the paper version were higher ($N = 35; M = 74.54$) than in the online version ($N = 165; M = 68.82, t(198) = -1.71; p = .09$).

4 Discussion

The present study examined the perceived and the actual environmental quality in Kamp-Lintfort. In order to extend previous research which has rather focused on either of both measures of quality so far, a comparison of both datasets was proceeded. The results show that the perceived and the actual environmental quality in Kamp-Lintfort do not match. The actual environmental quality is to be classified as *good* whereas people perceive it rather *moderate*. Further, the study could show that there are significant positive correlations between the perceived environmental quality and the perceived health. However, the assumption of the urban district moderating this correlation could not be proven in this examination.

4.1 Possible Reasons for the Mismatch of Actual and Perceived Environmental Quality

In order to make a decision on evaluating the environmental quality in Kamp-Lintfort, the results have to be reviewed separately and integrated into an overall assessment. Measuring the actual air quality of Kamp-Lintfort was conducted by analyzing the

pollutants PM10, NO₂, SO₂ and O₃. Since the amounts of PM10, SO₂ and O₃ in Kamp-Lintfort's air were lower than the given limits of EU and WHO, it was concluded that those pollutants' concentration can be assessed as good. Only the amount of NO₂ has exceeded the limits of EU und WHO every year since 2010, and are therefore considered as bad. Applying the PEQI, the mean category of all four pollutants was determined. This leads to the evaluation of actual air quality as *fair*. This is in accordance to the perceived air quality which is also in the category *fair*. When it comes to actual groundwater quality, Kamp-Lintfort's main problem are the nitrate values. Therefore, this research only focuses on this issue. The overall nitrate concentration is about 30 mg/l which is below the limit value of 50 mg/l. This means that the water quality can be described as good. Applying the PEQI, the value of groundwater quality can be referred to as *fair*. However, the perceived groundwater quality is *moderate*. This could be explained due to recent news on the landfill *Eyller Berg* which concerns the people living nearby (RP-Online, 2018). It is possible that they imagine that due to the rising hill, more toxic substances get into the ground and infiltrate the groundwater. Using the PEQI for assessment, the actual tap water quality can be reported as *very good*. The perceived tap water quality is valued *fair*. People might know that most of Germany's tap water is treated groundwater. This could lead to them thinking that treatment means it has to be better than untreated groundwater, still, it is not very good (Umweltbundesamt, 2016). Furthermore, the noise disturbance is limited to the outskirts of the city, more precisely, the location of the highways A42 and A59. Therefore, the traffic noise in Kamp-Lintfort is very low and can be described as *fair*. The perception of the present sample, however, is located in the category *moderate*. More than half of the area of Kamp-Lintfort consists of green spaces. As Kamp-Lintfort would be on rank 12 between Düsseldorf and Munich in the comparison with Germany's major cities' amount of green spaces (Statista, 2019a), the classification is *fair*. The participants perceive it to be significantly less and their rating is only located in the category *poor*. In order to come to a conclusion, all the environmental factors must be taken into consideration. As the actual quality of air, groundwater and green spaces is *fair*, the actual traffic noise disturbance is *moderate* and the actual tap water quality is *very good*, the overall actual environmental quality can be classified as *fair*. The perceived environmental quality can be classified as *moderate*. This difference between actual and perceived environmental quality is in accordance with hypothesis 1 stating that there is a mismatch between the data sets.

This mismatch might result from people's understanding of the word environmental quality. It is possible that they do not include all factors that were included in the present study. It is assumed that people might take tap water more into

consideration than groundwater when thinking of the environmental quality. This assumption is supported by the fact that tap water is correlated with every other item. Furthermore, people might not think of traffic noise when thinking about environmental quality. Since traffic noise disturbance is rated subjectively, people living in or visiting Kamp-Lintfort several times a week might have gotten used to the traffic noise (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit, 2014). Other than that, participants might be influenced in their behavioral responses by sociological factors such as media attention and prior experiences. Especially the *Diesel-Skandal*, which has been a current subject of discussion during the survey period, could have subconsciously influenced the participants' responses. Further, the media puts more recurrent attention on the issue of the quality of air than the quality of groundwater, for example, which may lead to an increased awareness of the former issue and stronger resulting opinions. This will, however, not be the case for participants with limited general awareness for environmental issues. Moreover, personal previous experiences can influence the participants' perception of environmental problems. The perception of the air quality in Kamp-Lintfort differs accordingly, depending whether the participant recently stayed in a larger city with much traffic or on a farm. A general unawareness of environmental issues might limit the message of the survey as well. However, the study included a control variable asking the participants to indicate their general awareness of environmental problems. Since the participants ranked themselves with a mean of 69.82, which is above average, this problem is either not critical in the presented survey or the answers are given in terms of social desirability.

The comparison of frequency distributions also shows that participants generally rate the environmental quality worse than it actually is. This behavioral response might be caused by a lack of trust in the government due to their limited action concerning environmental pollution. Lacking knowledge about green spaces or unawareness of their administrative belonging to Kamp-Lintfort could be possible reasons for the difference between actual and perceived amount of green spaces. Another reason may be the different evaluation of what is considered a green space. Some people may consider parks, cemeteries and playgrounds to be green space while others do not. This finding is also mirrored when almost one third of participants testified that the biggest potential for environmental improvement concerns the green spaces in Kamp-Lintfort. Unfortunately, the study cannot clarify whether the participants demand a general increase of green spaces or a qualitative amelioration of the existing ones. The dissatisfaction with green spaces is only partially reflected in the behavioral response concerning the LaGa. Participants tend to estimate the LaGa's influence on the environmental quality in Kamp-

Lintfort as only moderately good although the LaGa aims at the arrangement of more green spaces and an embellishment of the city in general. This attitude is most likely due to unawareness of the goals implemented by the LaGa.

4.2 Reasoning the Correlation between Perceived Health and Perceived Environmental Quality

Regarding the correlations, perceived health correlates significantly with perceived tap water quality, groundwater quality, air quality and the satisfaction with green spaces. As traffic noise is rated subjectively, people living in or visiting Kamp-Lintfort several times a week might have gotten used to the traffic noise (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit, 2014). This might explain why traffic noise does not correlate with perceived general health. Also, if people do not consider traffic noise as part of the environmental factors, they might not see it as a factor influencing their health. The significant positive correlation between perceived tap water quality and perceived health might be caused by the fact that the majority of the participants do use tap water as drinking water. Groundwater does as well correlate positively with perceived general health. This finding is rather surprising due to recent news on *Eyller Berg*. Since only some districts use groundwater as tap water, most people might not have enough information to rate groundwater quality. This is supported by the significant positive moderate correlation of perceived groundwater quality and perceived tap water quality. Satisfaction with green spaces correlates significantly with perceived health. This means people who rate their health better are also more satisfied with the green spaces or vice versa. As Barton, Hine, and Pretty (2009) found out, people who are more physically active in nature also perceive their health to be good. Furthermore, people walking in green spaces had a better mood which also supports the present outcomes (Barton et al., 2009). Previous research states that living surrounded by green spaces helps people to be in good mood and feel less stressed out (White et al., 2013). This could possibly explain why people rate themselves healthier while rating the environment quality good. Perceived air quality correlates positively with perceived general health as well. This outcome might be explained by physical activity of people rating themselves as healthy. Also the perceived air quality might be influenced by the district participants live in. Thus, the question arises whether the residents' health affects the perception of the city as having a good environment or whether high environmental quality leads to the residents feeling healthier.

The third hypothesis stated that the relationship between the perceived environmental quality and the perceived health is moderated by the urban district in

Kamp-Lintfort people live in. The present study showed no moderating effect of the urban district which can be explained by the not equally distributed amount of people (i.e. Saalhoff 0, Rossenray 1 and Center 43). An analysis of variance would have been possible if the groups roughly had the same amount of people in it and were evenly distributed. The survey in the field only being conducted in the Center of Kamp-Lintfort could have been a vital reason for the unequally distributed urban districts with most people living in the Center of Kamp-Lintfort. Therefore, it is advisable to actively aim for an equal amount of residents from each district by conducting the survey in the field in each urban district, for instance. The study design might underestimate the influence of the place of residence on the participants' answers. However, the subdivision in residents and non-residents was not taken into account for the statistical calculations since it only influenced environmental perception significantly in two regards, i.e. age and enjoy being in Kamp-Lintfort. Participants living in Kamp-Lintfort are generally older and enjoy their presence in Kamp-Lintfort more than weekly visitors. The average age of Kamp-Lintfort's inhabitants does not differ significantly from the average age of Germany (Statista, 2017) which means that it is improbable that people living in proximity to Kamp-Lintfort are significantly younger than Kamp-Lintfort's residents. It may thus be inferred that an age gap between the used sample and a random, commensurately conducted sample study with balanced gender relation is highly unlikely. The difference in evaluation concerning the quality of staying in Kamp-Lintfort is unsurprising. Residents usually state to enjoy being in their respective hometowns more due to their advanced knowledge of the city and their stronger local integration into a circle of family and friends (Sturm, Böltken, Göbel, Meyer, & Waltersbach, 2006). Weekly visitors are likely to have these effects in their respective hometown. In case of the occurrence of significant differences concerning the environmental perception between residents and non-residents, further research should only take the latter into account for statistic calculations.

4.3 Different Outcomes of Paper versus Online Version

Some differences in assessments were found between the online and the paper version of the questionnaire used in the present study. In the paper version, people perceived more traffic noise in Kamp-Lintfort which could be due to participants completing the survey outside. They may have been exposed to traffic noise while completing the survey in contrast to participants completing it online inside of a building. As for the environmental consciousness, the ratings in the paper version were higher which might be retraced to the same reason, i.e. participants of the paper version being directly exposed to the

environment when answering the questions. In addition to that, the weather at the day of conduction was inclement which might have affected the perception of the environment as well. This might provide an explanation for rating the perceived environmental quality worse than it actually is. Participants from the online survey like being in Kamp-Lintfort more which can be retraced to spreading the link to the survey in social media groups related to the city of Kamp-Lintfort. This could be explained by people who are part of those groups might have a special connection to the city of Kamp-Lintfort, and therefore rate the environmental quality of Kamp-Lintfort better. The differences in liking to drink tap water might be explicable by the fact that a part of the online participants reported not to drink tap water at all whereas this answering category was not chosen by participants of the paper version. This could have led to the mean in the paper version be marginally higher.

4.4 Ranking of Point Sources Does Not Match Expectation

Another interesting finding is the behavioral response regarding the question „Which of the following factor harms Kamp-Lintfort’s environmental quality the most?”. The participants were asked to rank the local sources of environmental pollution divided in traffic, *Eyller Berg*, *Asdonkshof* and the former coal mine according to their perceived environmental impact. Participants could assign every local source of pollution a value number from 1 = *very harmful* to 4 = *least harmful*. However, the arrangement of participants’ perceptions corresponds in no position with the arrangement established by the research group. The participants generally rated the *Eyller Berg*, as the strongest negative impact on Kamp-Lintfort’s environmental quality. both the *Asdonkshof* and traffic are ranked on the second place. The former coal mine was overall perceived at the last place, and thus diminishing Kamp-Lintfort’s environmental quality the least. As mentioned previously, these perceptions contrasted the order established by the researchers, which reads as follows:

1. *Traffic*. Traffic harms environmental quality the most. Air pollutants which are directly emitted into the ecosystem through traffic are deposited, and thus cause the most persistent environmental damage (Umweltbundesamt, 2015a). Through precipitation and snow the contaminants re-enter the ecosystem or deposit in sediments, vegetation and other materials. Additionally, human beings are prone to absorb PM10 by inhalation, thus leading to their depositing in lungs and the blood circulation (LANUV, n.d.). Despite its big influence on the environment

and human health, the pollution through particulate matters is invisible to the human eye which may justify the low ranking of traffic in the participants' perception of environmental influence.

2. *Eyller Berg*. As a current newspaper article demonstrates, residents living in proximity to the *Eyller Berg* are, amongst others, concerned due to the high elevation of its garbage dump (RP-Online, 2018). The officials in charge of the *Eyller Berg*, however, state their compliance to all governmental posed restrictions and assure no negative health effects. Nevertheless, there are usage restrictions for the use of wells in the immediate surrounding (Eyller Berg, Abfallbeseitigungsgesellschaft mbH, 2012). An examination in 2011 of different soil strata surrounding the *Eyller Berg* additionally proves that the lead values as well as the cadmium values partially exceed the restricted soil concentrations (LANUV, 2011).
3. *Former coal mine*. After the closing of the coal mine in 2012, soil contamination around the entire industrial area is still high and the pollution of groundwater is still a possible risk (Kamp-Lintfort, 2018). Nevertheless, the administration of Kamp-Lintfort pursues complex remediation plans to prevent groundwater pollution and to rearrange the industrial area into a central resort. Their so called *Masterplan Bergwerk West Kamp-Lintfort* for the LaGa (Kamp-Lintfort, n.d.a) aims at converting the area into a large recreational garden area including parks and playgrounds.
4. *Asdonkshof*. It is located on the last place since within the four compared problematic areas, it poses the smallest risk of pollution on the environment. Although the waste incineration plant has to face a negative image with many prejudices, as visible in the ranking of participants, it is recorded to comply to the required pollution limits (Asdonkshof, 2017).

A missing basis of knowledge may lead to an emotionally based behavioral response. Expressions such as *incineration plant* and *landfill site* are negatively associated. These prejudices are not likely to be countered by positive examples as the *Asdonkshof* which complies to its demanded restrictions. As seen in the differing order of rankings, a lack of information about these supposed points of pollution leads to a worse assessment on behalf of the inhabitants.

4.5 Challenge of Making the Comparison of Actual and Perceived Environmental Data Possible

The challenge within this study was the comparison between the actual and perceived environmental quality. It was not possible to compare the raw data due to the fact that they did not base on the same measuring and coding schemes. In order to overcome this obstacle, a new approach had to be found. This was achieved with the introduction of the PEQI. Statistical testing was still not possible, however, it was possible to compare the data descriptively. This allowed an inclusion of both actual and perceived data as well as an inclusion of different values of several years. Due to a low Cronbach's alpha value ($\alpha = .41$), it was not possible to create an index for the environmental perception, therefore, the items had to be analyzed on a single item level which could have led to an assimilation effect. The effect is caused by the influence of the overall context. So the person's overall opinion on the environmental quality could have influenced their opinion on tap water, for example. In general, it should be reconsidered to use the exact same questions again. If an index cannot be created, it means that the questions do not load on the same factor which, in this case, is environmental quality. It is suggested to do a pre-study to figure out which factors people consider when judging the environmental quality. Plus, as no specific data regarding the actual environmental quality for Kamp-Lintfort was available, existing data had to be taken from several sources such as the LINEG or the *Stadtwerke Kamp-Lintfort*. This was not possible for air quality so that mean values were calculated by averaging the values of the nearby cities Krefeld, Duisburg and Wesel. Deviation from the actual prevailing air quality in Kamp-Lintfort could be a result of the triangulation.

Considering the creation of a questionnaire being able to compare subjective impressions with objective data, the lack of objective data was a hindering fact. Due to the relatively small size of Kamp-Lintfort, there is a lack of conducted surveys and published data on the environmental quality of several fields. This limited the questionnaire in comparing the subjective and objective perception. Regarding the place and timing of conducting the survey, the participants turnout could have been influenced in terms of age and gender diversity. The survey was conducted online and in the field in Kamp-Lintfort. Due to inclement weather and the survey day during Christmas season, the paper version only had 35 participants compared to 165 participants in the online version. This quantitative difference affected the study results majorly since online questionnaires are more likely to be answered by a younger generation (Bandilla, Bosnjak, & Altdorfer, 2001). Therefore, the average age of participants is younger than Kamp-Lintfort's residents and can thus not be considered representative. Additionally, the online and paper version presented different response options for the question „How

do you perceive the disturbance caused by traffic during the day in Kamp-Lintfort?“. In the online version, participants had the opportunity to rate the disturbance caused by traffic on a scale from *very low* to *very high* whereas participants from the paper version had the opportunity to rate it on a scale ranging from *very bad* to *very good*. Although the answer options are quite similar and likely not to have a direct impact on the behavioral response of the participants, they reduce the standardization of the survey which future studies should avoid. Besides differences in answering categories, the implementation of the questionnaire posed another restriction on the accountability of the outcome as it included the possibility for participants to deny consent for the data generated while completing the questionnaire. However, the online questionnaire still allowed the participants to proceed in the study whilst making their answers unobtainable for analysis. Consequently, some completed online questionnaires could not be considered in the study outcome. This unavailability due to mistakes in completion also restricts the accountability of the paper version of the questionnaire. Behavioral response which included marking more options than possibly indicated or leaving questions unanswered, rendered some of the completed questionnaires incompatible for further analysis. This problem might be caused by the lack of time investigated in reading the instructions or lack of understanding of the supposedly self-explanatory questionnaire.

There are even more factors which are connected to influencing the response of participants in the presented survey. Participants were asked to give their answers on endpoint-based visual analog scales which ranged from *very bad* to *very good* without further indications of gradual differences. The avoidance of explicitly naming intermediary stages intended the prevention of influencing participants with additional verbal statements. However, endpoint-based scales are not able to guarantee the neutrality of participants, either. An influence on the participant through the study design can therefore not be excluded from consideration. As both the minimum and the maximum values of the questionnaire scales were used, suspicion arose that some of the respondents might not have taken the questionnaire serious. The behavioral responses were checked and none of the respondents answered extreme values exclusively. Furthermore, the questionnaire did not contain a response option labeled as *I do not know* where lacking knowledge about the matter could be indicated. This consequently increases the likelihood of participants evaluating a value as mediocre due to missing knowledge or because they think the value is mediocre. However, it is possible that the lacking options initiated a shift towards the extreme values. This positive or negative inclination is possibly due to expectancies created by the questionnaire. The implementation of a question in the survey creates the expectancy that it aims at measuring a significant

impact. The participants are therefore more likely to answer these questions with a strong tendency. In hindsight, the participant's answers might not reflect their opinion but rather the expected outcome of the questionnaire. Future research should thus implement a response option indicating a lack of knowledge. In case of this answer being predominantly chosen, the questionnaires shall not be used as evidence for statistical data collection.

4.6 Additional Future Implications

The discussion has resulted in the following aspects which should be taken into account during a replication. The present study should be modified in order to allow for a repetition without any complications. If the study is repeated, care should be taken to ensure a representative age distribution as well as a balanced gender ratio in order to increase the representativeness of the sample. The sample found shifted in favor of female participants, although according to the *Statistisches Bundesamt* (2018), the gender distribution in the population is approximately equal with 50.07% women. As 17.00% of the present sample are not residents, it must be well thought out, in the replication, whether or not only Kamp-Lintfort's residents are allowed to participate in the study. However, it will be more difficult to increase the response rate if not being a resident disqualifies from taking part in the study, but on the other hand, it is questionable if non-residents can judge the quality of the groundwater, for example, as good as residents. As for the traffic noise, the noise map showed that Kamp-Lintfort is not noisy but people experience the city as noisy. As a consequence, a distinction between assessing the noise where people live and assessing the noise because of the motorways should be made. Considering the place of living, it should also be asked for the source of noise in order to be able to find out which kind of noise really does bother people. Another point of research, which should be added to future research, is the aspect of eternity costs. People might be aware of the fact that the former coal mines will have many years of impact on the actual environmental quality, even after being closed, whereas sources of noise, for example, can be changed more easily.

The currentness of the conducted perceived environmental quality data will presumably change within the next couple of years due to the LaGa which will take place in Kamp-Lintfort in 2020. The LaGa will create a lot of new green spaces on the former coal mining area which can improve the perceived environmental quality. However, the LaGa attracting more visitors to the city must be considered. Newspaper articles reported that there would be a train station for the LaGa (NRZ, 2018; WAZ, 2018). This could

have a big impact on the amount of people who will travel to Kamp-Lintfort by car which means the noise disturbance due to traffic should not increase whereas the perceived air quality should increase because of the greater amount of plants in Kamp-Lintfort. Rumor has it that it might not happen which means most people will presumably come by car. This would much likely increase the perceived noise disturbance due to traffic and the perceived air quality would drop. To sum it up, no matter if Kamp-Lintfort will get a train station the actual and perceived values will certainly change.

5 Conclusions

In conclusion, the present study shows a connection between actual and perceived environmental quality. Hypothesis 1 stating the mismatch between data sets was confirmed. Hypothesis 2 assuming correlations between perceived health and perceived environment was confirmed as well. Only hypothesis 3 stating the moderation of perceived environmental quality and perceived health by location was not proven. Most studies used green spaces to operationalize actual environmental quality, therefore, it is necessary to conduct a survey taking more environmental factors into consideration. For that reason, future research should focus on different environmental factors when measuring both actual and perceived environmental quality. It is important to define those aspects to make sure biases are reduced to a minimum when collecting data on perceived environmental quality and health. Moreover, future studies need to make sure that the sample is not biased by conducting the survey in different locations and age groups to aim for a representative sample. Due to the changing climate and a higher awareness for the needs of the nature in general, it would be interesting to see if the perceived environmental consciousness of the people will change within the next couple of years and if that has an effect on the perceived environmental quality in general. As for the city of Kamp-Lintfort, it is highly recommended to replicate the present study after the LaGa in 2020 to see how it affects the actual environmental data as well as the perceived environmental data and perceived health of Kamp-Lintfort's residents.

REFERENCE LIST

- Abi-pur.de. (2017). Ruhrgebiet-der größte Ballungsraum Deutschlands und der drittgrößte Europas. Retrieved from <https://www.abipur.de/referate/stat/669168727.html> (05.01.2019)
- Alcock, I., White, M. P., Wheeler, B. W., Fleming, L. E., & Depledge, M. H. (2014). Longitudinal effects on mental health of moving to greener and less green urban areas. *Environmental science & technology*, 48(2), 1247-1255. doi: 10.1021/es403688w
- Ambrey, C., & Fleming, C. (2014). Public greenspace and life satisfaction in urban Australia. *Urban Studies*, 51(6), 1290-1321. doi: 10.1177/0042098013494417
- Asdonkshof (2017). Öffentliche Bekanntmachung der Emissionen gem. Bestimmung 6.13 des Planfeststellungsbeschlusses für das AEZ Asdonkshof in Kamp-Lintfort. Retrieved from https://www.aez-asdonkshof.de/fileadmin/user_upload/Asdonkshof_EMU_2017_Veroeffentlichung.pdf (08.01.2019)
- Asdonkshof. (2019). Unser Beitrag für eine nachhaltige Abfall- und Kreislaufwirtschaft. Retrieved from <https://www.aez-asdonkshof.de/index.php?id=42&L=344> (19.01.2019)
- Bandilla, W., Bosnjak, M., & Altdorfer, P. (2001). Effekte des Erhebungsverfahrens? Ein Vergleich zwischen einer Web-basierten und einer schriftlichen Befragung zum ISSP-Modul Umwelt. *ZUMBA Nachrichten*, 25(49), 7-28. urn: <https://nbn-resolving.org/urn:nbn:de:0168-ssoar-207925>
- Barton, J., Hine, R., & Pretty, J. (2009). The health benefits of walking in greenspaces of high natural and heritage value. *Journal of Integrative Environmental Sciences*, 6(4), 261-278. doi: 10.1080/19438150903378425
- Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental science & technology*, 44(10), 3947-3955. doi: 10.1021/es903183r
- Bruckmann, P., Pfeffer, U., & Hoffmann, V. (2014). 50 years of air quality control in Northwestern Germany—how the blue skies over the Ruhr district were achieved. Retrieved from https://www.lanuv.nrw.de/fileadmin/lanuv/luft/pdf/X741-Bruckmann_50-years_part-2.pdf (19.01.2019)
- Bühner, M. (2011). Einführung in die Test- und Fragebogenkonstruktion (3. Aufl.). Hallbergmoos: Pearson Deutschland GmbH.
- Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit. (2014). Was ist Lärm?. Retrieved from <https://www.bmu.de/themen/luft-laerm-verkehr/laermschutz/laermschutz-im-ueberblick/was-ist-laerm/> (19.01.2019)
- Dalai Lama, D. L. (n.d.). A Clean Environment Is a Human Right. Retreived from <https://www.dalailama.com/messages/environment/clean-environment> (03.01.2019)

Deutscher Bundestag. (1996). Umweltgutachten 1996. Retreived from <http://dipbt.bundestag.de/doc/btd/13/041/1304108.pdf> (29.12.2018)

De Vries, S., Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P. (2003). Natural environments—healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environment and planning A: Economy and Space*, 35(10), 1717-1731. doi: 10.1068/a35111

Drees, & Sommer. (2011). Endbericht Grundlagenermittlung (Machbarkeitsstudie/ Bestandsanalyse) zum Projekt „Masterplan Bergwerk West“. Retrieved from [https://www.kamp-lintfort.de/www2/sitzungsdienst.nsf/HTML/B762C08B8735C9C1C125791400367092/\\$FILE/Grundlagenermittlung%20Haupttext_1.pdf](https://www.kamp-lintfort.de/www2/sitzungsdienst.nsf/HTML/B762C08B8735C9C1C125791400367092/$FILE/Grundlagenermittlung%20Haupttext_1.pdf) (04.01.2019)

Eccleston, P. (2019). Public 'concerned on environment', survey says. Retrieved from <https://www.telegraph.co.uk/news/earth/earthnews/3312688/Public-concerned-on-environment-survey-says.html> (17.01.2019)

Environmental Law Alliance Worldwide. (2002). Act on the Prevention of Harmful Effects on the Environment Caused by Air Pollution, Noise, Vibration and Similar Phenomena. Retrieved from <https://www.elaw.org/system/files/de.air.noise.act.eng.pdf> (05.01.2019)

European Commission. (n.d.). Air Quality in Europe. Retrieved from <http://ec.europa.eu/environment/air/quality/standards.html> (09.01.2019)

European Commission. (2016). Environment Action Programme to 2020. Retrieved from <http://ec.europa.eu/environment/action-programme/> (05.01.2019)

Eyller Berg, Abfallbeseitigungsgesellschaft mbH (2012). Faktencheck zu den Einwänden der Gegner zur Sonderabfalldeponie Eyller Berg. Retrieved from <https://www.eyller-berg.de/fakten.html#fakt4> (08.01.2019)

Eyller-Berg Abfallbeseitigungsgesellschaft mbH. (2013). Die Deponie Eyller Berg. Retrieved from <https://www.eyller-berg.de/berg.html> (09.01.2019)

Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from <https://www.afhayes.com/public/process2012.pdf> (13.01.2019)

Kamp-Lintfort (n.d.a). Masterplan. Retrieved from <https://www.kamp-lintfort.de/de/wirtschaft/masterplan-1531072/> (08.01.2019)

Kamp-Lintfort. (n.d.b). Stadtgeschichte. Retreived from <https://www.kamp-lintfort.de/de/inhalt/geschichte/> (04.01.2019)

Kamp-Lintfort. (2012). Sonderserie Masterplan Bergwerk West: 04 Flächenaufbereitung. Retrieved from <https://www.kamp-lintfort.de/de/pressemitteilungen/sonderserie-masterplan-bergwerk-west-04-flaechenaufbereitung/> (19.01.2019)

Kamp-Lintfort (2018). Umweltbericht. Retrieved from [\\$file/22fnp_umweltbericht.pdf?OpenElement](https://www.kamp-lintfort.de/C1257621003422E9/files/22fnp_umweltbericht.pdf) (08.01.2019)

Kole ,P. J., Löhr, A. J.,Van Belleghem, F. G. A. J., & Ragas, Ad. M. J. (2017). Wear and Tear of Tyres: A Stealthy Source of Microplastics in the Environment. Int. J. Environ. Res. Public Health 2017, 14(10), 1265. doi: 10.3390/ijerph14101265

Kruize, H. (2007). On environmental equity: Exploring the distribution of environmental quality among socio-economic categories in the Netherlands. Doctoral thesis, 105-130. Retrieved from <https://dspace.library.uu.nl/handle/1874/22609> (05.01.2019)

LANUV (n.d.). Wirkung von Feinstaub (PM10). Retrieved from https://www.lanuv.nrw.de/umwelt/umweltmedizin/wirkungen_von_luftschadstoffen/schadstoffe/feinstaub_pm10/ (08.01.2019)

LANUV. (2001). Luftqualität in Nordrhein-Westfalen: Jahreskenngrößen 2001. p.14. Retrieved from https://www.lanuv.nrw.de/fileadmin/lanuv/luft/immissionen/ber_trend/LUQS-Kurzbericht.pdf (19.01.2019)

LANUV (2011). Abschlussbericht zum Amtshilfeersuchen vom 8.9.2011 der Bezirksregierung Düsseldorf. Probenahme und Untersuchung am 21.9/3.11.2011 in der Umgebung der Deponie Eyller Berg. Retrieved from https://www.lanuv.nrw.de/fileadmin/lanuv/umwelt/schadensfaelle/andere/Bericht_Eyller_Berg_24112011.pdf (08.01.2019)

LANUV. (2018). Belastungen von Oberflächengewässern und von aktiven Grubenwassereinleitungen mit bergbaubürtigen PCB (und PCB-Ersatzstoffen), Ergebnisse des LANUV-Sondermessprogramms,1. Folgebericht p.94. Retrieved from https://www.lanuv.nrw.de/fileadmin/lanuv/wasser/pdf/2018-12-05_Bericht_LANUV_PCB_Grubenwasser.pdf (18.01.2019)

Lee, A. C., & Maheswaran, R. (2011). The health benefits of urban green spaces: a review of the evidence. Journal of public health, 33(2), 212-222. doi: 10.1093/pubmed/fdq068

LINEG. (n.d.). Umwelterklärung. Retrieved from <https://www.lineg.de/umwelt/umwelterkl%C3%A4rung/> (29.12.2018)

Ma, L. (2014). "The Objective vs. the Perceived Environment: What Matters for Active Travel". (Doctoral dissertation, Oregon Department of Urban Studies and Planning). doi: 10.15760/etd.2088

Maas, J., Verheij, R.A., Groenewegen, P.P., de Vries, S., & Spreeuwenberg, P. (2006). Green space, urbanity, and health: how strong is the relation?. Journal of Epidemiology & Community Health, 60(7), 587-592. doi: 10.1136/jech.2005.043125

Maas, J., Verheij, R.A., Groenewegen, P.P., de Vries, S., & Spreeuwenberg, P. (2008). Physical activity as a possible mechanism behind the relationship between green space and health: a multilevel analysis. BMC public health, 8(1), 206. doi: 10.1186/1471-2458-8-206

Maas, J., Van Dillen, S. M., Verheij, R. A., & Groenewegen, P. P. (2009). Social contacts as a possible mechanism behind the relation between green space and health. Health & place, 15(2), 586-595. doi: 10.1016/j.healthplace.2008.09.006

Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen. (n.d.). Hintergrundpapier Steinkohle. p.18. Retrieved from https://www.bezreg-arnsberg.nrw.de/themen/w/wasserwirtschaft_untertagbau/hintergrundpapier.pdf (05.01.2019)

Mitchell, R., & Popham, F. (2007). Greenspace, urbanity and health: relationships in England. *Journal of Epidemiology & Community Health*, 61(8), 681-683. doi: 10.1136/jech.2006.053553

Nielsen, T. S., & Hansen, K. B. (2007). Do green areas affect health? Results from a Danish survey on the use of green areas and health indicators. *Health & place*, 13(4), 839-850. doi: 10.1016/j.healthplace.2007.02.002

NRW Umweltdaten vor Ort. (2017). Lärm. Retrieved from <https://www.uvo.nrw.de/uvo.html?lang=de> (19.01.2019)

NRZ. (2018). VRR setzt auch in Kamp-Lintfort auf ökologische Antriebe. Retreived from <https://www.nrz.de/staedte/moers-und-umland/vrr-setzt-auch-in-kamp-lintfort-auf-oekologische-antriebe-id215581673.html> (13.01.2019)

Nutsford, D., Pearson, A. L., & Kingham, S. (2013). An ecological study investigating the association between access to urban green space and mental health. *Public health*, 127(11), 1005-1011. doi: 10.1016/j.puhe.2013.08.016

Pokorny, D. (2001). Umweltqualitätsziele und Umweltstandards für eine dauerhaft-umweltgerechte Landnutzung. Retreived from <https://d-nb.info/963017209/34> (03.01.2019)

Postleitzahl Service. (n.d.). Kamp-Lintfort. Retrieved from <http://www.plz-postleitzahl.de/land.nordrhein-westfalen/kamp-lintfort/index.html> -assessed (03.01.2019)

Reklaitiene, R., Grazuleviciene, R., Dedele, A., Virviciute, D., Vensloviene, J., Tamosiunas, A., Baceviciene, M., Luksiene, D., Sapranaviciute-Zabazlajeva, L., Radisauskas, R., Bernotiene, G., Bobak, M., & Nieuwenhuijsen, M.J. (2014). The relationship of green space, depressive symptoms and perceived general health in urban population. *Scandinavian journal of public health*, 42(7), 669-676. doi: 10.1177/1403494814544494

Richardson, E. A., Pearce, J., Mitchell, R., & Kingham, S. (2013). Role of physical activity in the relationship between urban green space and health. *Public health*, 127(4), 318-324. doi: 10.1016/j.puhe.2013.01.004

RP-Online. (2018). Anwohner in Sorge ob der Höhe des Eyller Berges. Retreived from https://rp-online.de/nrw/staedte/kamp-lintfort/eyller-berg-interessengemeinschaft-in-kamp-lintfort-schreibt-dem-umweltministerium_aid-35205593 (09.01.2019)

Sommer, F., Dietze, V., Baum, A., Sauer, J., Gilge, S., Maschowski, C., & Gieré, R. (2018). Tire Abrasion as a major source of Microplastic in the Environment. *Aerosol and Air Quality Research*. 18, 2014–2028. doi: 10.4209/aaqr.2018.03.0099

Stabstelle Geoinformation. (n.d.). Zahlenspiegel Kamp-Lintfort. Retrieved from [\\$file/zahlenspiegel.pdf?OpenElement](https://www.kamp-lintfort.de/C1257567005F6C12/files/zahlenspiegel.pdf) (04.01.2019)

- Stadtwerke Kamp-Lintfort. (2012). Bundesgesetzblatt Jahrgang 2012 Teil I Nr. 58. Retrieved from <https://www.swkl.de/download/trinkwasser/Trinkwasserverordnung-2013.pdf> (04.01.2019)
- Statista (2017). Europäische Union: Durchschnittsalter der Bevölkerung in den Mitgliedsstaaten im Jahr 2017 (Altersmedian in Jahren). Retrieved from <https://ezproxy2.hsrw.eu:2265/statistik/daten/studie/248994/umfrage/durchschnittsalter-der-bevoelkerung-in-den-eu-laendern/> (08.01.2019)
- Statista. (2019a.). Anteil der Grünfläche deutscher Großstädte* im Jahr 2016. Retrieved from <https://de.statista.com/statistik/daten/studie/417098/umfrage/deutschlands-gruenste-staedte/> (19.01.2019)
- Statista. (2019b). Was unternehmen Sie persönlich, um Nachhaltigkeit zu fördern und selber nachhaltiger zu leben?. Retreived from <https://de.statista.com/statistik/daten/studie/820385/umfrage/persoenliches-engagement-zur-foerderung-von-nachhaltigkeit-in-deutschland/> (03.01.2019)
- Statistisches Bundesamt. (2018). Statistisches Jahrbuch 2018. Retrieved from https://www.destatis.de/DE/Publikationen/StatistischesJahrbuch/Bevoelkerung.pdf?__blob=publicationFile (05.01.2019)
- Stigsdotter, U. K., Ekholm, O., Schipperijn, J., Toftager, M., Kamper-Jørgensen, F., & Randrup, T. B. (2010). Health promoting outdoor environments-Associations between green space, and health, health-related quality of life and stress based on a Danish national representative survey. Scandinavian journal of public health, 38(4), 411-417. doi: 10.1177/1403494810367468
- Sturm, G., Böltken, F., Göbel, N., Meyer, K., & Waltersbacher, M. (2006). LebensRäume - Wohn- und Lebensbedingungen aus Sicht der Bewohnerinnen und Bewohner. In Bundesamt für Bauwesen und Raumordnung, Band 24, Bonn: Selbstverlag des Bundesamtes für Bauwesen und Raumordnung.
- Takano, T., Nakamura, K., & Watanabe, M. (2002). Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green spaces. Journal of Epidemiology & Community Health, 56(12), 913-918. doi: 10.1136/jech.56.12.896
- Umweltbundesamt. (2015a). Einträge von Schadstoffen. Retrieved from <https://www.umweltbundesamt.de/themen/luft/daten-karten/eintraege-von-schadstoffen> (08.01.2019)
- Umweltbundesamt. (2015b). Umweltbewusstsein 2014: Immer mehr Menschen sehen Umweltschutz nicht als Problem, sondern als Teil der Lösung. Retrieved from <https://www.umweltbundesamt.de/presse/pressemitteilungen/umweltbewusstsein-2014-immer-mehr-menschen-sehen> (03.01.2019)
- Umweltbundesamt. (2016). Trinkwasser. Retrieved from <https://www.umweltbundesamt.de/themen/wasser/trinkwasser> (19.01.2019)
- Umweltschutz.de. (2016). Retrieved from <http://www.umweltschutz.de/> (03.01.2019)

- Van den Berg, A. E., Maas, J., Verheij, R. A., & Groenewegen, P. P. (2010). Green space as a buffer between stressful life events and health. *Social science & medicine*, 70(8), 1203-1210. doi: 10.1016/j.socscimed.2010.01.002
- Van Herzele, A., & de Vries, S. (2012). Linking green space to health: A comparative study of two urban neighbourhoods in Ghent, Belgium. *Population and Environment*, 34(2), 171-193. doi: 10.1007/s11111-011-0153-1
- WAZ. (2018). Kamp-Lintfort bekommt 2021 einen Bahnhof – endlich. Retrieved from <https://www.waz.de/region/rhein-und-ruhr/ein-zug-fuer-kamp-lintfort-id215386217.html> (13.01.2019)
- Welsch, H. (2006). Environment and happiness: Valuation of air pollution using life satisfaction data. *Ecological economics*, 58(4), 801-813. doi: 10.1016/j.ecolecon.2005.09.006
- White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological science*, 24(6), 920-928. doi: 10.1177/0956797612464659
- Wood, L., Hooper, P., Foster, S., & Bull, F. (2017). Public green spaces and positive mental health—investigating the relationship between access, quantity and types of parks and mental wellbeing. *Health & Place*, 48, 63-71. doi: 10.1016/j.healthplace.2017.09.002
- World Health Organization. (n.d.). WHO Air Quality Guidelines (AQG). Retrieved from [http://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-airquality-and-health](http://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-airquality-and-health) (05.01.2019)

APPENDIX

Appendix A

A1. Syntax for SPSS.

```

DATA LIST FREE(TAB)
/CASE(F8.0)
/SERIAL(A4)
/REF(A4)
/QUESTNNR(A16)
/MODE(A16)
/STARTED(DATETIME)
/LG01_01(F8.0)
/LW01_01(F8.0)
/LW02_01(F8.0)
/LW03(F3.0)
/LW04_01(F8.0)
/GW01_01(F8.0)
/GW02_01(F8.0)
/LU01_01(F8.0)
/LU02_01(F8.0)
/LB01_01(F8.0)
/LB02_01(F8.0)
/GF01_01(F8.0)
/GF02_01(F8.0)
/GF03_01(F8.0)
/VB01(F3.0)
/RG01_01(F3.0)
/RG01_02(F3.0)
/RG01_03(F3.0)
/RG01_04(F3.0)
/SE01_01(F8.0)
/SE02_01(F8.0)
/SE03_01(F8.0)
/WG01_01(F8.0)
/WG01_02(F8.0)
/WG01_03(F8.0)
/WG01_04(F8.0)
/DD01_01(F8.0)
/DD02(F3.0)
/DD03(F3.0)
/DD04(F3.0)
/DD05_01(F8.0)
/DD06(F3.0)
/DD07_01(F8.0)
/BW01(F3.0)
/BW01_06(A128)
/KE01(F3.0)
/TIME001(F8.0)
/TIME002(F8.0)
/TIME003(F8.0)
/TIME004(F8.0)
/TIME005(F8.0)
/TIME006(F8.0)
/TIME007(F8.0)
/TIME008(F8.0)
/TIME_SUM(F8.0)
/MAILEDSENT(DATETIME)
/LASTDATA(DATETIME)
/FINISHED(F1.0)
/Q_VIEWER(F1.0)
/LASTPAGE(F8.0)
/MAXPAGE(F8.0)
/MISSING(F8.0)
/MISSREL(F8.0)
/TIME_RSI(F12.4)
/DEG_TIME(F8.0).
BEGIN DATA
107
    65      101      IP_Umwelt_Kali interview   22-11-2018 20:48:28   1       101      54      6      100
    2       3       101      101      7       87      86      48      91      5      1
    1       1       4       45      101      48      79      52      95      89      35
    19      32      12      35      16      2       2       1       1       17      48
    0       8       98      23      11      33      281
    8       0       0       0       1.12     8       31
22-11-2018 20:53:09
110
    26      83      IP_Umwelt_Kali interview   22-11-2018 20:48:44   76      64      50      7      97
    -9      -9      50      86      55      78      54      67      83      1      -9
    1       1       -9      101      43      42      83      101      91      85      68
    39      44      1       2       30      53      1       1       1       28      102
    0       8       115      26      20      36      410
    8       3       0       0       0.78     1
22-11-2018 20:55:34
111
    45      55      IP_Umwelt_Kali interview   22-11-2018 20:49:03   55      54      35      6      73
    2       1       54      55      47      42      61      51      60      2      3
    2       1       4       39      60      33      40      34      52      28      24
    12      25      3       24      24      68      3       1       9       43
    0       8       67      14      7       36      213
    8       0       0       0       1.6      31
22-11-2018 20:52:36
112
    50      64      IP_Umwelt_Kali interview   22-11-2018 20:51:22   67      47      48      6      84
    2       1       66      88      48      3       36      48      58      5      3
    2       2       4       23      86      47      100      71      101      62      27
    28      46      2       2       2       33      3       1       7       35
    0       8       90      23      9       13      251
    8       0       0       0       1.44     23
22-11-2018 20:55:33
113
    54      101      IP_Umwelt_Kali interview   22-11-2018 20:56:33   33      101      68      1      101
    2       3       59      101      51      101      36      30      101      2      1
    2       1       4       65      69      1       23      59      1       34      31
    17      26      2       2       31      101      3       1       10507      23
    0       8       104      20      14      19      238
    8       0       0       0       1.27     20
22-11-2018 23:55:23
115
    50      101      IP_Umwelt_Kali interview   22-11-2018 21:00:22   90      59      66      1      100
    -9      -9      65      73      53      81      67      71      77      4      -9
    2       1       -9      77      79      53      88      95      68      90      66
    25      32      2       31      69      69      3       1       8       49
    0       8       93      23      15      19      264
    8       3       0       0       1.26     15
22-11-2018 21:04:46
124
    62      47      IP_Umwelt_Kali interview   22-11-2018 21:24:43   50      60      43      6      59
    -9      -9      69      67      41      17      83      38      81      2      -9
    2       2       -9      49      73      81      43      51      101      71      28
    6       7       2       31      64      64      4       1       -9      5      28
    0       8       27      5       10      9       97
    8       6       3       3       2.58     135
22-11-2018 21:26:20
128
    85      101      IP_Umwelt_Kali interview   22-11-2018 21:28:13   1       74      62      6      101
    1       3       86      88      20      88      79      60      98      5      2
    1       1       4       47      82      73      79      57      69      71      34
    17      27      12      34      71      71      2       1       10      20
    0       8       54      26      9       20      183
    8       0       0       0       1.62     31
22-11-2018 21:31:16
131
    75      101      IP_Umwelt_Kali interview   22-11-2018 21:35:39   24      101      53      1      101
    1       2       101      101      26      1       49      76      100      5      3
    1       2       4       58      100      101      59      46      100      62      37
    1       2       1       1       101      3
22-11-2018 21:31:16
    1       86      100      101      3
22-11-2018 21:31:16

```

16	40	125	24	19	17	286	22-11-2018 21:41:36	1
0	8	8	0	0	1.11	13		
133		IP_Umwelt_Kali interview		22-11-2018 21:38:18		25	4	98
29	88	41	93	88	99	24	42	2
1	3	4	48	43	67	51	53	36
2	1	3	13		38	3	1	90
28	65	188	25	18	35	464	22-11-2018 21:46:54	1
0	8	8	0	0	0.7	1		
136		IP_Umwelt_Kali interview		22-11-2018 21:42:41		79	83	101
71	69	90	101	23	65	36	69	4
1	3	2	83	73	47	101	93	35
1	1	2	35		78	3	1	47
39	179	196	58	18	48	471	22-11-2018 21:52:48	1
0	8	8	0	0	0.61	0		
142		IP_Umwelt_Kali interview		22-11-2018 22:07:34		100	44	101
94	101	101	101	48	64	2	101	3
1	2	4	101	97	101	98	81	36
1	1	12	36		101	4		24
26	21	91	10	14	49	248	22-11-2018 22:11:42	1
0	8	8	0	0	1.45	26		
148		IP_Umwelt_Kali interview		22-11-2018 22:37:12		34	80	101
55	58	74	87	100	95	48	68	2
3	1	4	36	79	20	71	35	23
1	1	2	2		62	1	50	35
21	42	107	35	8	20	276	22-11-2018 22:41:48	1
0	8	8	0	0	1.29	16		
152		IP_Umwelt_Kali interview		22-11-2018 22:51:15		101	101	98
82	92	83	86	44	86	64	59	3
1	2	4	90	101	101	84	62	31
1	1	2	31		87	3	1	25
10	22	56	18	8	16	161	22-11-2018 22:53:56	1
0	8	8	0	0	1.98	49		
156		IP_Umwelt_Kali interview		22-11-2018 23:55:39		43	82	76
71	77	81	43	25	22	48	78	1
1	2	4	45	97	90	85	71	31
1	1	3	30		81	3	1	15
10	23	69	12	7	15	157	22-11-2018 23:58:16	1
0	8	8	0	0	2.2	60		
157		IP_Umwelt_Kali interview		22-11-2018 23:55:47		90	67	1
79	101	65	100	47	98	64	47	101
1	2	4	35	41	1	64	42	30
2	2			4	51	3	1	48
24	37	141	31	10	17	322	23-11-2018 00:01:09	1
0	8	8	0	0	1.12	8		
159		IP_Umwelt_Kali interview		23-11-2018 00:53:01		67	78	80
27	101	61	101	54	50	26	31	3
2	4	1	78	83	54	26	24	39
1	1	9	5		101	6	69	1
21	44	20	39	195	34	12	57	422
23-11-2018 01:00:03	1	0	8	8	0	0	0.88	2
165		IP_Umwelt_Kali interview		23-11-2018 07:13:34		1	78	15
75	92	93	66	15	65	47	74	4
1	2	3	21	8	1	26	69	35
1	1	12	29		17	4	1	19
19	25	56	18	10	16	168	23-11-2018 07:16:22	1
0	8	8	0	0	1.9	45		
166		IP_Umwelt_Kali interview		23-11-2018 07:25:04		79	101	101
26	101	74	101	9	4	36	54	4
3	2	1	78	86	17	98	101	20
2	2			6	65	6	Vorlesungen	101
26	40	201	32	14	28	392	23-11-2018 07:31:36	42
0	8	8	0	0	0			1
1.02	5							
168		IP_Umwelt_Kali interview		23-11-2018 08:09:28		33	54	32
28	83	88	99	38	38	55	48	97
3	4	1	36	1	10	50	43	2
1	1	9	1		90	1	1	38
23	35	139	54	15	95	352	23-11-2018 08:16:23	1
0	8	8	0	0	0.86	3		
169		IP_Umwelt_Kali interview		23-11-2018 08:09:45		74	50	17
56	86	95	96	47	42	66	69	2
1	3	4	52	80	66	82	96	33
1	1	5	33		101	2	1	39
18	35	131	29	7	28	297	23-11-2018 08:14:42	1
0	8	8	0	0	1.24	12		
170		IP_Umwelt_Kali interview		23-11-2018 08:16:27		51	75	2
50	72	66	97	35	73	43	56	2
1	3	4	73	49	65	69	81	39
2	1	2	10		65	3	67	49
22	55	171	27	10	23	382	23-11-2018 08:22:49	1
0	8	8	0	0	0.96	4		
171		IP_Umwelt_Kali interview		23-11-2018 08:16:58		15	34	38
30	101	64	101	1	101	38	54	101
1	2	4	64	65	36	86	62	37
1	1	13	37		101	4	1	32
21	26	93	21	11	23	237	23-11-2018 08:26:22	1
0	8	8	0	0	1.2	16		
172		IP_Umwelt_Kali interview		23-11-2018 08:22:14		40	88	88
56	92	55	90	15	66	28	60	92
1	4	2	62	82	17	86	81	35
2	1	12	32		63	3	1	14
9	18	50	9	6	13	130	23-11-2018 08:24:24	1
0	8	8	0	0	2.42	73		
173		IP_Umwelt_Kali interview		23-11-2018 08:22:22		100	101	101
101	95	98	97	1	98	41	98	2
1	3	4	101	101	55	49	35	45
1	1	8	45		100	3	1	86
21	53	478	73	20	54	445	23-11-2018 08:36:24	1
0	8	8	0	0	0.57	1		
174		IP_Umwelt_Kali interview		23-11-2018 08:22:44		75	65	84
81	101	101	101	37	28	36	78	7
1	2	4	50	87	31	101	71	3
1	1	12	28		100	5	101	35
22	44	96	17	8	33	265	23-11-2018 08:28:23	1
0	8	8	0	0	1.14	13		
176		IP_Umwelt_Kali interview		23-11-2018 08:24:20		75	66	16
66	71	69	90	57	52	64	66	50
2	3	4	90	54	57	97	79	1
2	2			7	66	1	63	21
43	43	172	54	13	19	408	23-11-2018 08:31:08	40
0	8	8	0	0	0.89	5		1
182		IP_Umwelt_Kali interview		23-11-2018 08:35:52		53	67	57
50	98	84	101	52	15	62	71	2
4	3	1	55	89	70	93	93	27
2	1	3	27		101	3	62	40
15	33	118	18	13	19	268	23-11-2018 08:40:20	1
0	8	8	0	0	1.31	16		
183		IP_Umwelt_Kali interview		23-11-2018 08:36:39		96	93	14
75	79	87	89	63	71	83	68	87
1	2	4	66	67	47	64	69	3
2	2			6	97	3	58	35
24	27	85	18	13	25	240	23-11-2018 08:40:39	1
0	8	8	0	0	1.28	14		
184		IP_Umwelt_Kali interview		23-11-2018 08:39:05		48	31	1
16	90	51	90	2	1	54	58	86
2	3	1	65	52	72	59	60	4
2	1	2	5		76	6	59	47
21	25	161	18	11	36	327	Gutachten	1
0	8	8	0	0	1.08	11	11	253

186		IP_Umwelt_Kali interview	23-11-2018 08:40:59	79	97	96	1	101
56	77	89_	96	93	101	80	78	2
1	3	4	83	78	65	82	88	42
2	1	12	42		79	3		32
22	35	124	22	11	41	296		1
0	8	8	0	0	1.18	11		
188		IP_Umwelt_Kali interview	23-11-2018 08:45:48	83	50	101	4	89
36	89	73_	86	69	90	36	27	2
1	3	4	48	32	7	16	17	32
2	1	3	12		21	3	1	10
17	40	127	16	12	16	269		31
0	8	8	0	0	1.39	19		1
191		IP_Umwelt_Kali interview	23-11-2018 08:52:56	88	83	9	2	101
90	97	75_	100	31	74	54	54	4
1	2	3	50	52	17	58	86	35
2	2			3	100	3	1	2163
30	113	167	28	21	22	370		191
0	8	8	0	0	0.65	3		1
193		IP_Umwelt_Kali interview	23-11-2018 08:54:02	19	52	60	7	101
25	101	67	101	47	68	34	22	3
2	4	1	76	55	20	78	62	30
1	2			2	44	4	1	14
22	42	94	30	10	18	274		44
0	8	8	0	0	1.18	9		1
194		IP_Umwelt_Kali interview	23-11-2018 08:58:33	101	2	1	7	101
25	57	65_	101	48	101	62	77	3
2	4	1	49	48	16	48	61	29
2	1	3	2		98	4		46
26	37	90	43	14	23	310		1
0	8	8	3	3	0.98	6		
196		IP_Umwelt_Kali interview	23-11-2018 09:00:28	84	101	55	6	101
79	66	82	78	35	72	45	53	4
3	2	1	77	101	59	93	86	23
1	1	2	23		101	5	1	8
21	49	256	34	14	37	462		43
0	8	8	0	0	0.99	7		1
197		IP_Umwelt_Kali interview	23-11-2018 09:03:17	55	79	48	7	101
37	89	84_	101	26	59	64	76	4
1	3	2	66	62	51	65	80	39
1	1	2	39		98	3	1	30
35	42	110	33	8	21	341		62
0	8	8	0	0	0.99	7		1
199		IP_Umwelt_Kali interview	23-11-2018 09:16:02	53	59	17	3	83
33	100	66	86	75	101	37	44	3
1	2	4	79	92	69	62	47	31
2	1	9	25		96	3	1	79
46	198	221	30	10	50	484		69
0	8	8	0	0	0.61	1		1
201		IP_Umwelt_Kali interview	23-11-2018 09:35:20	46	32	30	7	93
37	80	42	81	83	91	21	78	3
1	2	4	54	55	60	81	96	55
2	2			4	13	4	1	45
31	45	288	42	18	38	551		103
0	8	8	0	0	0.64	0		1
202		IP_Umwelt_Kali interview	23-11-2018 09:46:28	73	85	40	6	101
32	90	52	96	36	67	33	34	4
1	3	2	69	90	47	78	90	59
2	1	8	59		98	3	1	39
25	39	213	20	30	121	477		97
0	8	8	0	0	0.69	3		1
205		IP_Umwelt_Kali interview	23-11-2018 09:56:46	69	33	59	7	95
75	101	71_	101	86	100	80	91	1
2	3	4	79	92	84	96	85	63
1	1	12	63		82	4	1	14
18	39	114	25	11	24	287		42
0	8	8	0	0	1.15	7		1
208		IP_Umwelt_Kali interview	23-11-2018 10:07:27	58	81	47	6	78
16	101	85	98	78	36	51	57	1
1	2	4	76	71	25	79	75	33
2	1	12	5		100	5	1	13
28	34	128	21	12	20	287		31
0	8	8	0	0	1.2	11		1
211		IP_Umwelt_Kali interview	23-11-2018 10:20:32	48	45	42	7	87
62	101	83	101	101	101	42	39	1
2	3	4	71	75	30	78	74	36
2	1	2	9		64	1	1	13
24	57	126	23	14	117	339		50
0	8	8	0	0	0.89	2		1
212		IP_Umwelt_Kali interview	23-11-2018 10:22:36	37	60	40	6	80
48	69	54	77	40	24	31	52	3
2	1	4	52	50	50	54	53	30
2	1	4	2		37	5	1	40
48	73	153	58	14	47	498		65
0	8	8	0	0	0.62	0		1
213		IP_Umwelt_Kali interview	23-11-2018 10:24:34	73	29	31	7	77
26	80	83	86	71	77	51	44	4
1	3	2	53	56	56	51	29	24
1	1	8	24		61	3	1	7
23	29	93	29	11	16	246		38
0	8	8	0	0	1.4	20		1
214		IP_Umwelt_Kali interview	23-11-2018 10:27:37	52	11	101	2	69
32	90	55	78	78	82	57	65	4
1	2	3	93	46	24	29	34	54
1	1	5	54		101	2	1	16
30	39	139	25	12	25	334		48
0	8	8	0	0	1	3		1
215		IP_Umwelt_Kali interview	23-11-2018 10:39:49	44	54	13	4	79
68	76	79	70	77	101	37	19	1
3	2	4	69	90	13	76	92	25
1	1	8	25		92	3	1	80
42	76	221	40	14	35	487		117
0	8	8	0	0	0.59	0		1
217		IP_Umwelt_Kali interview	23-11-2018 10:51:08	55	101	56	7	101
64	101	55	94	82	101	48	57	1
2	3	4	61	70	46	54	101	24
2	1	12	19		21	1	1	10
13	22	83	26	10	29	221		28
0	8	8	0	0	1.47	23		1
218		IP_Umwelt_Kali interview	23-11-2018 11:01:07	16	81	43	6	101
101	101	88	101	32	51	43	42	1
4	2	3	59	59	82	80	78	36
1	1	10	32		90	4	9	42
34	56	119	34	9	34	337		1
0	8	8	3	3	1.04	7		
223		IP_Umwelt_Kali interview	23-11-2018 11:11:52	101	78	1	4	69
47	54	48	57	47	57	52	55	4
1	2	3	56	48	39	52	51	34
2	1	12	30		73	2	1	7
19	28	104	19	13	23	267		54
0	8	8	0	0	1.34	18		1
226		IP_Umwelt_Kali interview	23-11-2018 11:20:04	100	101	93	1	98
97	97	98	96	26	101	37	12	4
1	2	3	101	89	83	101	100	46
1	1	9	46		100	2	1	35
21	46	100	20	11	15	282		34
0	8	8	0	0	1.21	15		1
228		IP_Umwelt_Kali interview	23-11-2018 11:26:47	50	56	9	7	101
45	79	52	83	65	47	28	43	2
3	4	1	51	52	51	60	101	32
2	2	2		3	47	1	1	26

22	40	151	34	12	17	348		23-11-2018 11:32:35	1
0	8	8	0	0	1.03	7	55	7	84
232		IP_Umwelt_Kali interview		23-11-2018 11:30:42		33	50	59	2
37	71	53	69	71	64	56	48	21	27
3	4	1	62	29	69	51	48	1	28
2	2			4	24	1		1	48
26	39	146	33	9	20	349		23-11-2018 11:36:31	1
0	8	8	0	0	1.01	6			
233		IP_Umwelt_Kali interview		23-11-2018 11:31:26		83	101	101	1
101	60	64	53	47	71	64	73	101	2
3	4	1	29	78	37	81	90	84	20
2	2			5	59	1		1	25
14	53	80	16	7	20	225		23-11-2018 11:35:11	1
0	8	8	0	0	1.55	29			
234		IP_Umwelt_Kali interview		23-11-2018 11:32:17		55	66	66	100
55	99	74	98	44	74	54	73	97	1
2	3	4	66	83	61	79	70	72	35
2	1	2	3	91		3		1	27
19	37	108	22	17	24	269		23-11-2018 11:36:46	1
0	8	8	0	0	1.19	11			
235		IP_Umwelt_Kali interview		23-11-2018 11:32:32		77	83	17	6
76	87	64	81	44	50	44	52	69	3
2	1	4	60	78	49	81	85	67	21
2	2			5	64	1		1	39
17	29	103	25	8	18	256		23-11-2018 11:36:48	1
0	8	8	0	0	1.31	17			
236		IP_Umwelt_Kali interview		23-11-2018 11:34:06		45	23	1	3
1	97	24	98	101	101	50	4	101	1
2	4	3	101	101	5	47	48	57	36
2	1	8	36		101	3		1	51
22	32	127	16	16	24	324		23-11-2018 11:39:30	1
0	8	8	0	0	1.07	9			
238		IP_Umwelt_Kali interview		23-11-2018 11:36:01		67	54	66	1
60	95	79	100	5	97	59	29	93	4
2	3	1	73	50	23	75	56	26	29
2	1	2	29	43		3		1	72
39	49	170	37	17	49	448		23-11-2018 11:44:15	1
0	8	8	0	0	0.65	0			
239		IP_Umwelt_Kali interview		23-11-2018 11:36:16		63	78	90	1
78	79	70	90	61	40	45	40	73	1
4	2	3	63	85	52	95	95	101	23
2	1	8	2	71		5		1	80
16	63	165	36	7	76	441		23-11-2018 11:44:42	1
0	8	8	0	0	0.84	8			
240		IP_Umwelt_Kali interview		23-11-2018 11:38:31		58	78	101	1
44	101	80	100	101	101	73	76	98	3
1	4	2	50	74	31	66	75	82	54
1	1	8	52		101	3		1	62
48	82	227	34	16	69	555		23-11-2018 11:47:46	1
0	8	8	0	0	0.65	0			
241		IP_Umwelt_Kali interview		23-11-2018 11:39:29		60	101	68	1
52	1	69	101	48	101	22	1	101	1
3	4	2	62	68	28	73	50	67	20
1	2			5	58	1		1	68
23	75	114	7	13	13	334		23-11-2018 11:45:03	1
0	8	8	0	0	1.31	29			
242		IP_Umwelt_Kali interview		23-11-2018 11:41:52		12	53	19	2
80	100	59	101	76	101	28	15	101	3
2	1	4	79	52	36	61	41	72	27
2	1	3	27		1	3		1	40
14	41	78	25	6	33	244		23-11-2018 11:45:56	1
0	8	8	0	0	1.45	23			
243		IP_Umwelt_Kali interview		23-11-2018 11:42:42		88	60	62	1
72	99	52	98	73	77	55	51	101	2
1	2	4	92	69	55	69	85	68	50
2	1	2	1	79		3		1	40
41	56	181	40	20	44	502		23-11-2018 11:51:04	1
0	8	8	0	0	0.62	0			
244		IP_Umwelt_Kali interview		23-11-2018 11:44:07		85	83	1	6
56	101	94	93	16	57	64	77	101	4
1	3	2	81	91	1	74	92	84	28
2	1	2	28		101	3		1	39
71	55	167	19	8	33	358		23-11-2018 11:50:52	1
0	8	8	0	0	1.01	8			
248		IP_Umwelt_Kali interview		23-11-2018 11:47:53		85	101	101	101
86	88	74	97	73	85	15	27	82	4
2	1	3	67	48	39	74	55	74	26
1	1	8	2	77		5		1	37
18	33	80	28	8	37	251		23-11-2018 11:52:04	1
0	8	8	0	0	1.28	15			
251		IP_Umwelt_Kali interview		23-11-2018 11:50:33		28	80	69	1
23	78	60	67	4	5	38	29	71	4
1	2	3	71	95	15	26	16	69	30
1	1	2	25		92	4		1	25
21	22	79	25	8	14	200		23-11-2018 11:53:53	1
0	8	8	0	0	1.72	36			
252		IP_Umwelt_Kali interview		23-11-2018 11:59:51		81	86	64	1
38	86	89	101	46	78	47	55	77	3
2	1	4	64	80	54	62	79	83	32
2	1	8	32		82	3		1	64
86	67	118	31	11	53	388		23-11-2018 12:07:21	1
0	8	8	0	0	0.75	1			
255		IP_Umwelt_Kali interview		23-11-2018 12:02:51		99	60	4	98
55	89	43	101	20	54	39	56	101	4
1	3	2	73	66	63	64	78	33	33
2	1	13	6	99		3		1	39
27	41	126	31	19	39	336		23-11-2018 12:08:07	1
0	8	8	0	0	0.93	1			
256		IP_Umwelt_Kali interview		23-11-2018 12:10:47		62	39	7	4
18	6	29	6	37	28	68	67	81	4
3	2	1	72	76	80	68	71	85	55
2	1	12	9	87		3		1	74
32	78	198	37	20	34	486		23-11-2018 12:18:53	1
0	8	8	0	0	0.74	1			
257		IP_Umwelt_Kali interview		23-11-2018 12:12:13		48	91	66	1
47	82	81	86	52	75	43	75	79	4
2	3	1	45	28	26	71	63	66	39
2	1	5	39		69	3		1	54
29	63	154	41	15	72	437		23-11-2018 12:19:30	1
0	8	8	0	0	0.84	4			
258		IP_Umwelt_Kali interview		23-11-2018 12:15:21		64	55	1	90
43	62	67	87	33	41	33	54	69	3
1	2	4	72	73	30	83	74	93	34
2	1	2	30		79	1		1	94
47	87	305	67	23	102	452		23-11-2018 12:28:30	1
0	8	8	0	0	0.42	0			
259		IP_Umwelt_Kali interview		23-11-2018 12:16:47		34	78	64	101
51	55	37	98	70	54	101	27	96	5
2	3	4	61	86	62	62	32	60	36
2	1	8	36		97	3		1	29
14	23	112	20	18	33	261		23-11-2018 12:21:08	1
0	8	8	0	0	1.31	18			
269		IP_Umwelt_Kali interview		23-11-2018 12:26:16		54	1	1	5
21	1	47	1	27	4	31	26	2	4
1	3	2	80	1	4	4	28	2	48
2	1	12	48		101	3		1	60
32	51	167	34	18	36	431		23-11-2018 12:33:27	1
0	8	8	0	0	0.74	0			
273		IP_Umwelt_Kali interview		23-11-2018 12:30:32		83	36	62	101
76	101	37	96	71	79	35	62	92	3

1	2	4	66	88	47	91	50	78	76	37
1	2	6	73	4	48	180	.9	4	22	
20	21	15	10	11						1
0	8	3	3	1.98						
275		IP_Umwelt_Kali interview	23-11-2018 12:30:41		54	48	1	4	101	
1	101	101	1	1	48	100	101	5	3	
4	1	101	52	5	60	101	98	52	63	
2	1	12	63		101	3	1	41	100	
61	70	229	30	17	35	546				1
0	8	8	0	0	0.61	0				
282		IP_Umwelt_Kali interview	23-11-2018 12:33:59		84	34	14	5	97	
35	86	59	88	26	91	47	51	76	1	
2	3	1	101	28	16	35	29	14	46	
2	1	4	2		24	6	die LAGA	1	16	109
17	24	265	15	8	21	410				
0	8	8	0	0	1.23	19				1
284		IP_Umwelt_Kali interview	23-11-2018 12:40:02		24	85	15	2	81	
83	74	66	83	62	76	26	29	92	3	
3	2	4	72	67	85	68	48	44	85	
2	2			5	51	1		1	7	51
26	40	100	36	12	17	289				
0	8	8	0	0	1.23	14				1
287		IP_Umwelt_Kali interview	23-11-2018 13:00:02		76	44	19	2	25	
12	96	57	78	72	60	56	74	67	1	
1	2	4	58	68	78	67	71	92	77	
1	1	12	38		46	2		1	18	55
26	38	129	30	21	73	390				1
0	8	8	0	0	0.82	1				
291		IP_Umwelt_Kali interview	23-11-2018 13:16:25		78	68	89	7	99	
51	92	72	95	50	67	35	66	85	1	
1	2	3	75	87	56	81	56	81	82	
1	1	2	28		70	4		1	28	61
30	148	403	38	12	70	408				1
0	8	8	0	0	0.6	0				
292		IP_Umwelt_Kali interview	23-11-2018 13:32:43		73	74	11	2	98	
69	96	73	101	33	60	48	66	81	5	
4	3	2	79	49	83	50	49	85	58	
1	1	2	30		88	1		1	40	60
25	43	196	30	21	56	471				1
0	8	8	0	0	0.72	0				
299		IP_Umwelt_Kali interview	23-11-2018 13:48:27		101	101	101	1	101	
55	101	101	101	1	3	63	101	101	1	
3	2	4	56	72	67	86	86	93	93	
1	1	8	43		101	2		1	10	59
30	44	139	30	13	31	356				1
0	8	8	0	0	0.97	3				
301		IP_Umwelt_Kali interview	23-11-2018 13:56:18		66	68	48	4	92	
50	68	81	93	26	90	35	78	95	2	
1	3	2	64	62	23	64	62	81	62	
1	1	9	38		101	3		1	7	44
25	3286	119	28	8	14	288				1
0	8	8	0	0	1.24	18				
302		IP_Umwelt_Kali interview	23-11-2018 13:59:42		42	50	101	1	101	
47	101	72	101	69	75	26	54	101	2	
1	2	4	72	74	50	68	40	65	66	
2	1	3	0		84	1		1	10	26
13	34	223	20	8	31	365				1
0	8	8	0	0	1.34	20				
310		IP_Umwelt_Kali interview	23-11-2018 14:52:46		96	85	101	1	101	
55	77	87	99	101	101	53	82	101	4	
1	3	4	101	101	59	71	101	83	87	
2	1	12	36		100	3		1	20	30
27	42	107	21	9	28	284				1
0	8	8	0	0	1.14	9				
311		IP_Umwelt_Kali interview	23-11-2018 14:53:06		94	73	101	1	101	
60	101	90	95	31	75	55	98	94	1	
1	2	3	73	51	19	28	48	21	40	
2	1	2	56		101	5		1	8	27
13	33	93	20	10	14	218				1
0	8	8	0	0	1.6	30				
315		IP_Umwelt_Kali interview	23-11-2018 15:05:29		49	21	1	3	84	
39	78	54	79	69	35	35	36	63	2	
2	1	3	82	61	52	86	84	86	85	
1	1	12	1		58	6		1	41	54
25	43	131	22	13	41	370				1
0	8	8	3	2	0.88	2				
317		IP_Umwelt_Kali interview	23-11-2018 15:16:23		36	59	85	1	93	
1	4	99	92	26	29	54	26	81	5	
2	1	4	66	75	34	45	48	52	54	
2	1	2	47		70	5		1	14	94
35	44	131	41	13	19	391				1
0	8	8	0	0	0.93	4				
318		IP_Umwelt_Kali interview	23-11-2018 15:21:58		67	93	55	6	101	
79	93	83	88	79	74	57	61	101	5	
1	2	3	56	74	97	80	75	101	79	
1	1	2	24		101	3		1	14	36
21	33	127	33	12	25	301				1
0	8	8	0	0	1.1	6				
319		IP_Umwelt_Kali interview	23-11-2018 15:26:33		76	57	52	7	101	
54	101	54	101	21	76	22	30	78	3	
3	1	4	75	81	40	76	76	50	55	
1	2	2	4		41	1		1	35	76
38	63	218	38	43	26	506				1
0	8	8	0	0	0.64	1				
320		IP_Umwelt_Kali interview	23-11-2018 15:30:22		32	62	48	7	51	
72	79	69	83	52	50	62	45	69	5	
1	3	4	48	67	31	73	73	76	67	
2	2			1	71	4		1	32	162
35	90	216	35	18	28	498				1
0	8	8	0	0	0.64	1				
321		IP_Umwelt_Kali interview	23-11-2018 15:33:52		29	65	12	7	65	
70	71	52	67	74	70	29	38	56	4	
2	1	4	75	69	70	89	80	91	89	
1	1	2	2		37	1		1	5	32
24	27	62	20	7	23	200				1
0	8	8	0	0	1.68	34				
323		IP_Umwelt_Kali interview	23-11-2018 15:37:48		50	101	101	1	101	
69	35	84	94	1	7	29	31	51	5	
1	3	4	63	78	63	96	83	46	82	
2	1	8	18		101	1		1	7	29
20	43	83	28	14	45	269				1
0	8	8	3	3	1.94	74				
325		IP_Umwelt_Kali interview	23-11-2018 15:53:25		31	46	1	3	98	
29	101	54	99	30	52	50	40	79	1	
1	2	4	85	55	74	59	47	79	50	
1	1	12	31		101	2		-.9	2	20
13	21	78	19	11	14	178				1
0	8	8	0	0	1.23	14				
327		IP_Umwelt_Kali interview	23-11-2018 16:22:44		80	79	34	6	101	
76	101	101	101	101	101	60	42	101	5	
2	4	3	65	79	90	66	88	85	84	
1	2			3	77	1		1	10	29
17	26	33	4	20	13	152				1
0	8	8	0	0	1.89	77				
332		IP_Umwelt_Kali interview	23-11-2018 16:37:52		81	70	83	1	101	
8	71	74	87	20	81	77	64	101	1	
2	3	1	26	57	101	62	86	39	51	
1	1	3	50		36	4		1	8	44
36	43	199	32	14	64	440				1
0	8	8	0	0	0.92	5				

333	79	97	IP_Umwelt_Kali interview	23-11-2018 17:15:09	77	79	62	1	96
	1	4	73	88	35	52	66	1	3
	1	1	2	46	72	79	73	2	32
	14	28	5	32		84	3	24	34
	0	8	113	21	9	25	268		1
335	76	101	IP_Umwelt_Kali interview	23-11-2018 17:21:16	43	64	38	2	98
	1	2	78	97	55	73	52	2	3
	1	1	4	74	67	32	44	7	34
	14	31	8	34		100	2	7	32
	0	8	88	26	9	26	233		1
336	59	101	IP_Umwelt_Kali interview	23-11-2018 17:28:38	87	86	47	2	88
	1	3	101	101	52	101	71	1	4
	1	1	2	93	90	86	60	90	65
	53	73	9	65		101	3	1	79
	0	8	252	48	20	49	591		1
344	32	99	IP_Umwelt_Kali interview	23-11-2018 18:31:26	77	82	82	1	99
	2	4	61	100	77	100	54	4	3
	2	1	1	101	74	29	67	53	55
	23	251	8	3		79	3	1	56
	0	8	81	36	18	38	316		1
352	47	101	IP_Umwelt_Kali interview	23-11-2018 20:08:34	33	88	69	1	101
	3	2	87	101	55	81	71	1	4
	2	1	1	66	101	5	101	101	58
	27	67	8	58		101	3	1	86
	0	8	342	36	32	43	421		1
354	51	79	IP_Umwelt_Kali interview	23-11-2018 20:31:29	51	76	101	1	101
	1	4	99	98	101	101	68	1	2
	2	1	3	83	76	32	54	55	60
	44	54	12	12		99	5	1	58
	0	8	206	39	30	34	537		1
	8	0	0	0	0.61	0			
357	50	101	IP_Umwelt_Kali interview	23-11-2018 21:20:32	26	50	20	7	101
	1	2	78	101	14	78	36	45	3
	1	1	4	83	73	66	101	101	24
	21	33	8	24		55	3	1	25
	0	8	65	16	8	16	189		1
	8	0	0	0	0.59	0			
361	54	52	IP_Umwelt_Kali interview	23-11-2018 21:36:27	34	72	78	1	78
	3	4	55	76	43	76	62	88	1
	1	1	2	86	59	66	81	83	40
	30	51	8	36		66	5	1	44
	0	8	183	23	18	56	441		1
	8	0	0	0	0.77	1			
362	68	95	IP_Umwelt_Kali interview	23-11-2018 21:44:36	62	48	59	1	57
	1	3	101	101	48	101	78	73	2
	2	1	4	57	53	3	83	81	32
	20	29	9	32		50	3	-9	10
	0	8	103	26	12	20	224		1
	8	3	8	3	1.7	48			
363	77	65	IP_Umwelt_Kali interview	23-11-2018 21:49:23	26	76	43	6	74
	2	1	1	60	50	52	60	45	4
	1	1	3	48	55	48	76	74	30
	16	40	3	30		66	2	1	36
	0	8	210	29	18	27	391		1
	8	0	0	0	1.02	6			
364	9	101	IP_Umwelt_Kali interview	23-11-2018 22:27:41	74	101	34	6	99
	1	2	49	101	60	51	71	1	3
	2	1	4	64	96	68	75	79	30
	25	38	2	30		101	3	1	62
	0	8	159	21	10	18	341		1
	8	0	0	0	1.21	14			
365	55	101	IP_Umwelt_Kali interview	23-11-2018 22:59:24	57	50	56	1	95
	2	1	50	101	43	72	53	101	3
	2	1	4	80	87	53	88	89	41
	36	57	12	41		101	3	1	98
	0	8	299	35	13	26	404		1
	8	0	0	0	0.8	2			
366	48	89	IP_Umwelt_Kali interview	23-11-2018 23:07:52	28	35	46	3	101
	1	3	62	98	22	18	42	28	4
	2	1	2	43	33	23	39	28	40
	33	61	2	27		87	3	1	49
	0	8	172	33	26	48	511		1
	8	0	0	0	0.62	0			
367	36	101	IP_Umwelt_Kali interview	23-11-2018 23:13:29	90	35	64	3	101
	2	3	19	101	43	29	74	101	4
	1	1	1	65	85	21	48	27	24
	28	48	8	24		101	3	1	85
	0	8	119	24	7	16	365		1
	8	0	0	0	1.07	12			
372	73	101	IP_Umwelt_Kali interview	23-11-2018 23:39:03	78	78	66	3	100
	1	2	96	100	69	96	31	62	3
	1	1	4	79	40	1	77	85	37
	22	44	5	37		96	5	1	37
	0	8	109	19	13	25	278		1
	8	0	0	0	1.21	11			
373	79	101	IP_Umwelt_Kali interview	23-11-2018 23:49:22	87	84	49	6	101
	3	1	82	86	26	55	28	47	2
	2	1	4	71	101	32	85	74	34
	26	38	8	13		97	3	1	48
	0	8	126	25	11	27	325		1
	8	0	0	0	1	3			
375	88	76	IP_Umwelt_Kali interview	23-11-2018 23:59:39	42	78	100	1	101
	1	2	75	95	37	64	79	85	4
	1	1	3	92	90	54	98	90	36
	45	45	12	26		95	3	1	43
	0	8	103	21	18	48	339		1
	8	0	0	0	0.91	4			
376	80	101	IP_Umwelt_Kali interview	24-11-2018 00:02:49	93	80	87	4	101
	1	4	40	101	66	101	58	66	2
	2	1	3	90	77	39	75	78	53
	49	66	3	13		100	3	1	48
	0	8	163	33	18	27	396		1
	8	0	0	0	0.8	1			
380	82	101	IP_Umwelt_Kali interview	24-11-2018 01:41:18	36	101	66	1	101
	2	1	81	101	76	63	43	74	3
	2	1	4	95	51	23	56	48	29
	23	37	8	29		98	1	19	46
	0	8	127	30	12	32	317		1
	8	0	0	0	1.07	4			
382	42	101	IP_Umwelt_Kali interview	24-11-2018 02:51:58	76	88	90	1	101
	2	1	86	101	16	42	49	101	5
	1	1	4	75	87	101	74	92	25
	24	36	5	57		79	5	1	35
	0	8	99	27	7	55	297		1
	8	0	0	0	1.14	9			
383	19	99	IP_Umwelt_Kali interview	24-11-2018 07:19:40	39	27	23	3	101
	4	2	81	101	17	42	49	85	3
	1	1	1	57	59	55	38	55	48
	29	48	8	3		44	1	1	49
	0	8	132	30	11	52	384		1
	8	0	0	0	0.83	1			
388	88	99	IP_Umwelt_Kali interview	24-11-2018 07:57:38	42	86	79	1	100
	1	3	84	100	21	36	35	92	4
	2	1	2	81	63	3	88	83	50
	2	1	2	49	89	4	1	3	26

13	21	141	24	16	47	291	24-11-2018 08:02:29	1
0	8	8	0	0	1.51	41		
390	55	89	57	95	68	97	24-11-2018 08:36:18	101
1	2	4	68	73	38	90	42	3
2	1	2	35	30	66	3	62	76
16	22	77	30	12	41	264	73	101
0	8	8	0	0	1.19	14		29
392	78	81	60	69	66	78	24-11-2018 09:22:35	82
1	3	4	56	70	43	72	27	40
2	1	8	29	91	3	24-11-2018 08:40:42	35	
19	34	96	19	11	29	248	1	37
0	8	8	3	3	1.36	18		1
393	9	83	5	87	38	69	24-11-2018 10:01:51	93
1	3	2	73	88	23	50	55	97
2	1	8	50	87	6	6	31	85
1	36	64	30	102	225	Berichte über Probleme/Tatsachen anderer stillgelegter Bergwerke	24-11-2018 09:26:43	50
31	11	31	471	24-11-2018 10:10:42	1	0	8	8
395	0	0.74	1					0
396	81	81	97	98	15	86	24-11-2018 10:24:10	92
1	2	3	36	81	67	69	86	80
2	1	8	22	54	5	50	80	85
21	51	100	17	11	94	273	1	13
0	8	8	0	0	1.13	24-11-2018 10:29:45	11	28
397	58	101	47	101	14	101	24-11-2018 10:48:10	101
1	2	4	101	60	1	34	41	101
2	1	2	27	101	1	9	10	6
36	73	209	43	26	47	537	1	50
0	8	8	0	0	0.68	24-11-2018 10:57:07	2	92
398	50	101	54	101	12	48	24-11-2018 11:17:34	101
3	4	4	101	51	4	47	40	74
2	1	2	11	83	3	25	47	1
29	34	107	20	14	42	288	1	12
0	8	8	0	0	1.12	24-11-2018 11:22:22	9	30
401	62	64	75	78	36	35	IP_Umwelt_Kali interview	99
3	1	4	63	74	31	47	47	2
1	1	8	6	82	1	36	76	50
16	22	69	17	9	16	184	1	49
0	8	8	0	0	1.68	24-11-2018 11:55:11	34	1
402	82	98	97	101	60	58	IP_Umwelt_Kali interview	86
1	2	4	69	94	39	59	67	3
2	1	12	12	89	4	67	98	41
31	55	157	33	12	42	392	1	53
0	8	8	0	0	0.93	24-11-2018 13:26:37	4	1
404	38	87	40	101	34	101	IP_Umwelt_Kali interview	101
1	2	3	83	56	45	41	67	4
1	1	12	64	43	3	54	50	64
38	61	156	38	20	74	451	1	58
0	8	8	3	3	0.89	24-11-2018 14:06:06	9	1
405	55	101	54	101	24	101	IP_Umwelt_Kali interview	101
1	4	3	76	87	6	101	54	2
2	1	4	1	79	1	66	101	48
14	26	89	22	11	22	229	1	32
0	8	8	0	0	1.39	24-11-2018 14:06:59	19	1
408	89	91	92	92	34	86	IP_Umwelt_Kali interview	90
2	1	4	83	95	16	85	35	3
2	1	9	5	88	3	19	95	36
14	34	97	24	11	23	249	1	45
0	8	8	0	0	1.29	24-11-2018 14:55:28	14	32
409	74	97	97	98	8	67	IP_Umwelt_Kali interview	83
1	2	3	85	89	50	80	82	4
1	1	13	36	79	1	76	96	36
19	44	103	26	9	48	331	1	45
0	8	8	0	0	0.99	24-11-2018 15:15:15	6	1
410	68	101	69	101	45	101	IP_Umwelt_Kali interview	101
1	3	4	62	47	24	23	43	2
1	1	12	52	37	2	32	100	53
31	67	168	37	23	53	446	14	53
0	8	8	0	0	0.74	24-11-2018 15:26:52	0	1
411	87	88	101	101	82	85	IP_Umwelt_Kali interview	101
1	2	4	76	82	30	72	65	3
1	2	12	64	44	4	65	76	55
24	39	102	21	12	16	260	1	34
0	8	8	0	0	1.27	24-11-2018 15:58:37	14	1
413	78	101	101	101	99	40	IP_Umwelt_Kali interview	101
2	3	4	68	89	11	70	42	1
2	1	12	73	100	3	86	101	75
27	43	151	27	17	61	452	1	41
0	8	8	0	0	0.73	24-11-2018 18:39:51	0	85
416	75	101	92	101	12	100	IP_Umwelt_Kali interview	92
1	3	2	87	88	49	60	46	99
2	1	8	31	101	1	89	52	61
41	64	187	47	27	87	570	1	58
0	8	8	0	0	0.54	24-11-2018 22:26:35	0	1
417	33	61	24	93	55	73	IP_Umwelt_Kali interview	92
4	3	2	55	100	73	47	38	4
2	1	3	28	71	4	14	100	31
21	49	116	30	12	26	312	1	43
0	8	8	0	0	0.91	24-11-2018 22:58:44	3	1
418	59	75	23	82	48	75	IP_Umwelt_Kali interview	94
1	2	3	77	92	63	16	47	4
1	1	2	50	96	5	5	97	50
28	58	183	37	18	58	462	1	45
0	8	8	0	0	0.71	24-11-2018 22:43:08	0	1
419	101	101	97	99	69	81	IP_Umwelt_Kali interview	100
2	1	4	83	88	76	66	16	3
3	2	1	1	1	1	59	10	100
34	48	207	35	44	55	463	-9	57
0	8	8	3	3	0.7	24-11-2018 22:44:28	0	1
422	85	101	51	88	59	90	IP_Umwelt_Kali interview	101
2	4	3	55	69	21	52	38	1
2	1	8	29	89	3	43	67	29
22	29	118	38	11	57	330	71	39
0	8	8	0	0	1.01	24-11-2018 23:29:19	5	1

423			IP_Umwelt_Kali interview	25-11-2018 00:27:30	35	24	42	4	95
	40	93	76	101	55	98	45	85	4
	1	2	3	74	72	75	50	81	4
	2	1	9	35	67	4			44
	17	31	76	20	19	39	256		45
	0	8	8	0	0	1.24	15		1
424			IP_Umwelt_Kali interview	25-11-2018 09:30:23	43	38	7	3	80
	46	90	59	1	39	62	43	54	2
	4	3	1	57	59	28	52	54	51
	2	1	9	24	101	1			36
	22	32	97	35	11	31	285		1
	0	8	8	0	0	1.07	7		
426			IP_Umwelt_Kali interview	25-11-2018 09:42:32	83	52	48	4	99
	31	43	81	90	34	57	65	75	2
	1	2	4	47	84	101	78	71	3
	2	1	12	23	92	4			46
	41	56	150	30	17	36	400		47
	0	8	8	0	0	0.79	0		1
430			IP_Umwelt_Kali interview	25-11-2018 12:44:28	71	95	101	1	101
	72	43	96	101	69	74	44	40	3
	1	2	4	54	84	36	71	85	64
	2	1	3	62	85	3			35
	21	54	130	24	12	48	334		1
	0	8	8	0	0	1.06	6		
435			IP_Umwelt_Kali interview	25-11-2018 13:21:25	54	85	60	1	81
	55	84	89	90	69	50	31	71	4
	1	2	3	74	68	52	49	79	51
	2	1	8	60	98	3			60
	48	101	256	31	17	80	534		106
	0	8	8	0	0	0.6	0		
438			IP_Umwelt_Kali interview	25-11-2018 13:49:21	81	98	48	2	60
	16	100	81	101	25	50	30	66	3
	1	2	4	76	69	24	60	50	32
	2	1	8	26	81	3			45
	21	49	91	39	11	73	353		1
	0	8	8	0	0	0.9	4		
439			IP_Umwelt_Kali interview	25-11-2018 13:55:51	50	16	31	3	95
	69	79	72	100	7	92	21	68	4
	1	2	3	73	84	55	97	101	33
	1	1	8	33	101	3			60
	42	73	149	29	12	47	456		1
	0	8	8	0	0	0.71	0		
440			IP_Umwelt_Kali interview	25-11-2018 14:29:01	69	68	37	4	92
	70	96	69	94	49	49	67	67	2
	1	3	4	84	99	101	101	91	55
	2	1	12	55	101	3			29
	20	47	88	24	9	33	272		1
	0	8	8	0	0	1.15	10		
441			IP_Umwelt_Kali interview	25-11-2018 14:56:40	63	54	53	1	92
	7	74	54	73	54	55	69	47	2
	1	3	4	75	66	83	52	67	71
	1	1	12	48	76	4			38
	21	35	102	20	15	37	278		1
	0	8	8	0	0	1.16	10		
442			IP_Umwelt_Kali interview	25-11-2018 15:05:41	36	71	74	1	100
	25	93	64	101	78	81	56	60	2
	1	3	4	62	88	52	93	88	47
	2	1	12	47	57	3			41
	28	58	179	33	14	30	402		1
	0	8	8	0	0	0.86	1		
448			IP_Umwelt_Kali interview	25-11-2018 15:50:05	36	61	2	7	101
	48	52	45	87	74	85	47	76	3
	4	2	1	74	74	79	62	54	35
	2	1	12	35	64	3			30
	26	38	123	22	9	16	279		1
	0	8	8	0	0	1.26	14		
449			IP_Umwelt_Kali interview	25-11-2018 17:14:16	7	67	62	1	93
	2	101	24	101	72	81	47	51	4
	2	3	1	57	50	28	53	35	26
	1	1	8	26	62	5			61
	24	81	184	32	18	41	501		1
	0	8	8	0	0	0.69	0		
451			IP_Umwelt_Kali interview	25-11-2018 20:09:18	50	44	54	4	92
	44	73	60	80	100	91	27	38	3
	1	2	4	74	77	79	38	34	40
	2	1	8	40	60	3			37
	26	44	127	33	14	69	365		1
	0	8	8	0	0	0.9	1		
454			IP_Umwelt_Kali interview	26-11-2018 07:58:16	71	48	1	4	101
	35	101	58	101	53	101	48	55	4
	1	2	3	62	60	52	38	40	53
	2	1	8	31	67	3			43
	24	45	103	29	13	87	355		1
	0	8	8	0	0	0.97	4		
456			IP_Umwelt_Kali interview	26-11-2018 13:41:22	91	76	87	7	101
	66	97	76	69	81	101	60	64	4
	1	3	2	101	62	52	101	86	46
	2	2	12	42	6	75	3	1	56
	23	34	126	25	16	17	320		1
	0	8	8	0	0	1.06	8		
460			IP_Umwelt_Kali interview	26-11-2018 19:42:50	26	61	101	1	101
	62	101	47	101	100	69	31	27	2
	1	3	4	66	80	34	81	92	31
	2	1	3	31	101	3			34
	20	37	119	24	10	16	268		1
	0	8	8	0	0	1.36	18		
467			IP_Umwelt_Kali interview	28-11-2018 02:34:10	26	76	100	1	101
	57	92	75	101	30	83	33	40	4
	1	3	2	71	87	87	60	18	42
	1	1	12	42	101	3			33
	53	50	126	36	14	52	343		1
	0	8	8	0	0	0.96	7		
469			IP_Umwelt_Kali interview	28-11-2018 12:14:37	37	73	18	6	96
	38	71	71	57	35	40	23	55	4
	2	1	3	33	61	28	93	97	24
	1	2	1	50	1	1			54
	35	84	302	44	14	29	401		1
	0	8	8	0	0	0.75	1		
470			IP_Umwelt_Kali interview	28-11-2018 13:58:02	59	62	60	4	98
	62	53	73	74	68	59	46	60	3
	1	2	4	49	55	83	61	69	26
	2	1	9	3	33	42	3	1	53
	27	40	82	25	14	21	276		1
	0	8	8	0	0	1.11	8		
476			IP_Umwelt_Kali interview	28-11-2018 17:30:52	85	65	83	1	101
	80	99	43	101	81	90	59	81	2
	1	3	4	74	78	1	62	98	22
	1	2	1	12	19	72	5	1	48
	18	34	128	43	10	66	346		1
	0	8	8	0	0	1.03	9		
479			IP_Umwelt_Kali interview	28-11-2018 17:41:02	66	90	55	7	90
	35	56	89	92	45	59	69	73	4
	1	2	3	69	50	68	94	86	23
	1	1	12	19	72	5			48
	25	49	140	25	12	79	395		1
	0	8	8	0	0	0.88	1		
480			IP_Umwelt_Kali interview	28-11-2018 17:42:22	47	83	51	6	96
	57	59	47	73	40	75	69	81	3
	1	4	2	73	77	24	64	68	22
	1	1	9	22	71	3			92

26	57	143	26	12	31	425		28-11-2018 17:49:27	1
0	8	8	0	0	0.82	1			
484		IP_Umwelt_Kali interview		28-11-2018 21:30:57		101	90	62	1
71	86	93	66	53	101	48	101	101	101
1	3	2	63	56	50	74	101	1	4
1	1	9	16	63	3	3	101	85	16
43	107	241	69	56	54	499		1	34
0	8	8	0	0	0.42	0			170
485		IP_Umwelt_Kali interview		28-11-2018 21:32:24		93	90	81	1
74	78	80	85	20	90	49	86	75	4
1	3	2	67	76	70	65	81	66	55
2	1	9	32	74	3	1		10	75
57	121	246	73	32	69	507		28-11-2018 21:43:47	1
0	8	8	0	0	0.57	3			
487		IP_Umwelt_Kali interview		28-11-2018 23:47:45		50	67	83	1
45	25	50	78	79	71	32	29	74	5
1	2	4	67	76	72	60	54	64	45
2	1	12	5	28	1	1		7	34
31	34	115	20	14	66	321		28-11-2018 23:53:06	1
0	8	8	0	0	1.16	13			
492		IP_Umwelt_Kali interview		29-11-2018 10:08:04					
				2	3				
			3	29-11-2018 10:08:07	1	0	1	1	0
494	0	3	192	IP_Umwelt_Kali interview	29-11-2018 10:20:10	62	39	16	4
56	101	69	101	63	76	50	26	77	4
1	3	2	77	63	28	59	59	101	53
2	1	4	30	30	70	5		1	40
18	35	86	21	13	22	255		29-11-2018 10:24:26	1
0	8	8	0	0	1.2	12			
498		IP_Umwelt_Kali interview		29-11-2018 13:31:24		101	86	100	1
95	101	101	101	101	100	63	101	96	93
1	3	4	98	100	101	101	101	101	2
2	1	12	8	101	101	5		1	66
27	61	163	18	17	32	377		29-11-2018 13:40:23	123
0	8	8	0	0	0				1
0.77	3								
499		IP_Umwelt_Kali interview		29-11-2018 13:31:57		101	62	91	1
101	101	101	101	101	101	62	53	101	82
1	2	4	101	101	98	67	95	95	69
1	1	8	21	101	101	1		1	172
23	1697	200	43	20	50	436		29-11-2018 14:08:55	1
0	8	8	0	0	0.62				
1	500								
55	88	85	96	24	60	26	43	48	4
1	2	3	84	67	40	77	50	83	57
2	2	2	5	78	1	1		1	29
29	76	126	23	10	17	332		29-11-2018 14:06:49	1
0	8	8	0	0	1.11	11			
501		IP_Umwelt_Kali interview		29-11-2018 16:11:28		23	75	26	1
63	81	26	90	35	92	36	13	100	91
3	4	1	63	99	65	101	87	100	2
2	1	12	22	1	1	1		1	23
19	40	124	36	38	32	321		29-11-2018 16:17:15	51
0	8	8	0	0	1.05	9			1
502		IP_Umwelt_Kali interview		29-11-2018 17:14:00		17	101	73	1
28	101	29	101	12	81	59	52	101	101
1	4	3	76	65	85	22	27	101	2
1	1	8	56	78	78	2		1	57
26	54	101	28	13	37	355		29-11-2018 17:19:55	59
0	8	8	0	0	0.86	2			1
503		IP_Umwelt_Kali interview		29-11-2018 20:31:50		76	82	48	4
83	88	94	96	71	83	28	89	83	94
2	1	4	72	84	87	78	76	74	28
1	1	9	3	82	82	4		1	55
16	269	114	42	7	62	346		29-11-2018 20:41:22	1
0	8	8	0	0	1.07	15			
505		IP_Umwelt_Kali interview		30-11-2018 07:16:06		71	95	76	1
85	93	74	83	46	52	78	88	92	90
3	4	2	82	47	29	95	85	78	29
1	1	5	29	92	2	2		1	40
23	95	168	54	11	66	418		30-11-2018 07:23:56	1
0	8	8	0	0	0.82	2			
506		IP_Umwelt_Kali interview		30-11-2018 09:02:09		84	64	67	1
48	79	80	95	55	95	29	24	93	101
1	2	3	63	62	24	66	72	69	4
2	1	10	28	91	91	3		1	22
13	14	40	12	16	20	142		30-11-2018 09:04:31	1
0	8	8	0	0	2.18	62			
507		IP_Umwelt_Kali interview		30-11-2018 11:30:44		76	1	1	3
24	101	57	101	62	101	67	35	67	101
2	1	4	61	34	33	74	54	71	25
2	1	12	1	26	1	1		1	37
33	39	93	25	9	36	283		30-11-2018 11:35:27	1
0	8	8	0	0	1.13	9			
509		IP_Umwelt_Kali interview		30-11-2018 17:44:10		95	51	48	6
83	91	52	95	64	83	52	45	87	82
4	1	2	51	68	26	50	23	65	30
2	1	9	25	74	3	1		1	59
28	45	170	46	16	35	441		30-11-2018 17:51:31	1
0	8	8	0	0	0.74	0			
517		IP_Umwelt_Kali interview		01-12-2018 23:02:58		81	81	51	1
81	101	51	101	51	71	41	51	51	81
3	2	4	51	51	1	41	41	41	21
1	2	5	81	1	1	1		6	59
17	65	71	41	11	15	285		01-12-2018 23:07:43	1
0	8	8	0	0	1.36	24			

END DATA.

VARIABLE WIDTH SERIAL REF QUESTNNR MODE BW01_06 (8) STARTED MAILSENT LASTDATA
(20)

***** Variable und Value Labels *****

VARIABLE LABELS

CASE 'Interview-Nummer (fortlaufend)'
 SERIAL 'Seriennummer (sofern verwendet)'
 REF 'Referenz (sofern im Link angegeben)'
 QUESTNNR 'Fragebogen, der im Interview verwendet wurde'
 MODE 'Interview-Modus'
 STARTED 'Zeitpunkt zu dem das Interview begonnen hat'
 LG01_01 'Frage zu LaGa: Wie schätzen Sie den Einfluss der Landesgartenschau auf die Umwelt in Kamp-Lintfort ein?'
 LW01_01 'Trinkwasser Empfindung: Wie empfinden Sie die Leitungswasserqualität in Kamp-Lintfort?'
 LW02_01 'Trinkwasser Germ/Ungern: Wie gerne trinken Sie Leitungswasser in Kamp-Lintfort?'
 LW03_01 'Trinkwasser Kategorien'
 LW04_01 'Trinkwasser Wichtigkeit: Wie wichtig ist Ihnen die Leitungswasserqualität in Kamp-Lintfort?'
 GW01_01 'Grundwasser Empfindung: Wie schätzen Sie die Grundwasserqualität in Kamp-Lintfort ein?'
 GW02_01 'Grundwasser Wichtigkeit: Wie wichtig ist Ihnen die Grundwasserqualität in Kamp-Lintfort?'
 LU01_01 'Luft Empfindung: Wie empfinden Sie die Luftqualität in Kamp-Lintfort?'
 LU02_01 'Luft Wichtigkeit: Wie wichtig ist Ihnen die Luftqualität in Kamp-Lintfort?'
 LB01_01 'Lärm Empfinden: Wie empfinden Sie die Lärmbelästigung durch Straßenverkehr tagsüber in Kamp-Lintfort?'
 LB02_01 'Lärm Wichtigkeit: Wie wichtig ist Ihnen Ruhe (bezogen auf Lärmbelästigung durch Straßenverkehr tagsüber) in Kamp-Lint...'!
 GF01_01 'Grünflächen_Prozentschätzung: Was schätzen Sie, zu welchem Teil Kamp-Lintfort aus Grünflächen besteht?'

GF02_01 'Grünflächen_Zufriedenheit: Wie zufrieden sind Sie mit der Anzahl der Gru?nflä?chen in Kamp-Lintfort?'
 GF03_01 'Grünflächen_Wichtigkeit: Wie wichtig sind Ihnen Grünflächen in Kamp-Lintfort?'
 VB01 'Verbesserungspotential_PE'
 RG01_01 'Rangordnung_SchadendeFaktoren: ... der Straßenverkehr'
 RG01_02 'Rangordnung_SchadendeFaktoren: ... der Eyller Berg (Mülldeponie)'
 RG01_04 'Rangordnung_SchadendeFaktoren: ... das ehemalige Bergwerk'
 SE01_01 'SE_Umweltbewusstsein: Wie umweltbewusst schätzen Sie sich selbst ein?'
 SE02_01 'SE_AktuelleStimmung: Wie würden Sie Ihre aktuelle Stimmung beschreiben?'
 SE03_01 'SE_Stress: Wie gestresst haben Sie sich in den vergangenen sieben Tagen gefühlt?'
 WG01_01 'Fragen zu Wahrgenommener Gesundheit: Wie würden Sie Ihren Gesundheitszustand im Allgemeinen beschreiben?'
 WG01_02 'Fragen zu Wahrgenommener Gesundheit: Wie würden Sie Ihren Gesundheitszustand im Vergleich zu anderen Personen in ihrem...'
 WG01_03 'Fragen zu Wahrgenommener Gesundheit: Wie würden Sie Ihren seelischen Gesundheitszustand im Allgemeinen beschreiben?'
 WG01_04 'Fragen zu Wahrgenommener Gesundheit: Wie würden Sie Ihren körperlichen Gesundheitszustand im Allgemeinen beschreiben?'
 DD01_01 'Alter: Wie alt sind Sie?'
 DD02 'Geschlecht'
 DD03 'Wohnort_Kali'
 DD04 'Stadtteil_Kali'
 DD05_01 'Wohnzeit_Kali: Seit wie vielen Jahren wohnen Sie bereits in Kamp-Lintfort?'
 DD06 'WöchentlicherAufenthalt_Kali'
 DD07_01 'Gerne_Kali: Wie gerne sind Sie in Kamp-Lintfort?'
 BW01 'Meinung_Bergwerk'
 BW01_06 'Meinung_Bergwerk: Sonstiges,'
 KE01 'Kenntnis und Einverständnis'
 TIME001 'Verweildauer Seite 1'
 TIME002 'Verweildauer Seite 2'
 TIME003 'Verweildauer Seite 3'
 TIME004 'Verweildauer Seite 4'
 TIME005 'Verweildauer Seite 5'
 TIME006 'Verweildauer Seite 6'
 TIME007 'Verweildauer Seite 7'
 TIME008 'Verweildauer Seite 8'
 TIME_SUM 'Verweildauer gesamt (ohne Ausreißer)'
 MAILSENT 'Versandzeitpunkt der Einladungsmail (nur für nicht-anonyme Adressaten)'
 LASTDATA 'Zeitpunkt der Datensatz das letzte mal geändert wurde'
 FINISHED 'Wurde die Befragung abgeschlossen (letzte Seite erreicht)?'
 Q_VIEWER 'Hat der Teilnehmer den Fragebogen nur angesehen, ohne die Pflichtfragen zu beantworten?'
 LASTPAGE 'Seite, die der Teilnehmer zuletzt bearbeitet hat'
 MAXPAGE 'Letzte Seite, die im Fragebogen bearbeitet wurde'
 MISSING 'Anteil fehlender Antworten in Prozent'
 MISSREL 'Anteil fehlender Antworten (gewichtet nach Relevanz)'
 TIME_RSI 'Maluspunkt für schnelles Ausfüllen'
 DEG_TIME 'Maluspunkte für schnelles Ausfüllen'
 .

 VALUE LABELS
 /LG01_01 LW01_01 GW01_01 LU01_01 SE02_01 WG01_01 WG01_02 WG01_03 WG01_04
 1 'Schr schlecht' 101 'Schr gut' -9 'nicht beantwortet'
 /LW02_01 DD07_01 1 'Sehr ungern' 101 'Schr gern' -9 'nicht beantwortet'
 /LW03_1 'Ich trinke Leitungswasser in Kamp-Lintfort.'
 2 'Ich trinke generell kein Wasser.' 3 'Aussehen (z.B. Trübheit)'
 4 'Geschmack' 5 'Geruch' 6 'Fehlende Kohlensäure' 7 'Sonstiges'
 -9 'nicht beantwortet'
 /LW04_01 GW02_01 LU02_01 LB02_01 GF03_01 1 'Schr unwichtig' 101 'Schr wichtig'
 -9 'nicht beantwortet'
 /LB01_01 1 'Schr niedrig' 101 'Schr hoch' -9 'nicht beantwortet'
 /GF01_01 1 '0%' 101 '100%' -9 'nicht beantwortet'
 /GF02_01 1 'Schr unzufrieden' 101 'Schr zufrieden' -9 'nicht beantwortet'
 /VB01_1 'Grundwasserqualität' 2 'Leitungswasserqualität' 3 'Luftqualität'
 4 'Lärmbelästigung' 5 'Grünflächen' -9 'nicht beantwortet'
 /RG01_01 RG01_02 RG01_03 RG01_04 1 'Rangplatz 1' 2 'Rangplatz 2'
 3 'Rangplatz 3' 4 'Rangplatz 4' -9 'nicht eingordnet'
 /SE01_01 1 'Gar nicht umweltbewusst' 101 'Schr umweltbewusst'
 -9 'nicht beantwortet'
 /SE02_01 1 'Schr gestresst' 101 'Schr entspannt' -9 'nicht beantwortet'
 /DD02_1 'Männlich' 2 'Weiblich' 3 'Divers' -9 'nicht beantwortet'
 /DD03 KE01_1 Ja 2 Nein -9 'nicht beantwortet'
 /DD04 2 'Geisbruch' 3 'Gestfeld' 4 'Hoerstgen' 5 'Kamp' 8 'Lintfort'
 9 'Niersenbruch' 10 'Rossenray' 11 'Saalhof' 12 'Stadt kern' 13 'Dachsbruch'
 -9 'nicht beantwortet'
 /DD06_1 'Sel tener als 1 mal' 2 '1 mal' 3 '2 mal' 4 '3 mal' 5 '4 mal' 6 '5 mal'
 7 '6 mal' 8 '7 mal' -9 'nicht beantwortet'
 /BW01_1 'Ich habe keine Meinung zum Bergwerk.'
 2 'Ich habe selbst dort gearbeitet.'
 3 'Mindestens ein Familienmitglied hat dort gearbeitet.'
 4 'Befreundete haben dort gearbeitet.' 5 'Die räumliche Nähe zum Bergwerk.'
 6 'Sonstiges' -9 'nicht beantwortet'
 /FINISHED 0 'abgebrochen' 1 'ausgefüllt'
 /Q_VIEWER 0 'Teilnehmer' 1 'Durchklicker'
 .

 MISSING VALUES
 LG01_01 LW01_01 LW02_01 LW04_01 GW01_01 GW02_01 LU01_01 LU02_01 LB01_01
 LB02_01 GF01_01 GF02_01 GF03_01 RG01_01 RG01_02 RG01_03 RG01_04 SE01_01
 SE02_01 SE03_01 WG01_01 WG01_02 WG01_03 WG01_04 DD07_01 (-9)
 LW03_VB01 DD02 DD03 DD04 DD06 BW01 KE01 (-8,-9)

A2. Instruction: How to turn the raw data set into the data set worked with

1. Downloading and executing the SPSS syntax from SoSciSurvey
2. Deleting of the following items:
 - a. SERIAL
 - b. REF
 - c. QUESTNNR
 - d. MODE
 - e. STARTED
 - f. TIME001
 - g. TIME002
 - h. TIME003
 - i. TIME004
 - j. TIME005
 - k. TIME006
 - l. TIME007
 - m. TIME008
 - n. TIME_SUM
 - o. MAILSENT
 - p. LASTDATA
 - q. FINISHED
 - r. Q_VIEWER
 - s. LASTPAGE
 - t. MAXPAGE
 - u. MISSREL
 - v. TIME_RSI
 - w. DEG_TIME
3. Adding the item “Survey” in order to distinguish between online (1) and paper pencil (2) versions
4. Input of paper pencil data
5. Deleting the following CASES:
 1. 124
 2. 194
 3. 218
 4. 273
 5. 325
 6. 362
 7. 392
 8. 404
 9. 410
 10. 419
 11. 492

6. Rearranging the order of variables according to the questionnaire which means following order:
 1. LW01_01
 2. LW04_01
 3. LW02_01
 4. LW03
 5. GW01_01
 6. GW02_01
 7. LU01_01
 8. LU02_01
 9. LB01_01
 10. LB02_01
 11. GF01_01
 12. GF03_01
 13. GF02_01
 14. VB01
 15. RG01_01
 16. RG01_02
 17. RG01_03
 18. RG01_04
 19. BW01
 20. BW01_06
 21. LG01_01
 22. SE01_01
 23. SE02_01
 24. SE03_01
 25. WG01_01
 26. WG01_02
 27. WG01_03
 28. WG01_04
 29. DD01_01
 30. DD02
 31. DD03
 32. DD04
 33. DD05_01
 34. DD06
 35. DD07_01
 36. KE01
 37. Survey
7. Recoding item LB01_01 → LB_Empf_umc as there was a mistake in the descriptions of the scale in the paper-pencil version: reversing the polarities, 101 becomes 1 and vice versa. But **ONLY IN THE PAPER VERSION** (choose cases “Survey = 2”)
8. Inverting items (101 = 1, 100 = 2, ... 1 = 101):

- a. SE03_01 → Stress
- b. LB_Empf_umc → LB_Empf_umc_inv

9. Calculation of Cronbachs Alpha for

- a. . LW01_01 + GW01_01 + LU01_01 + LB_Empf_umc_inv + GF02_01
(Perception of environmental quality; ***NOT USABLE***)
- b. . LW04_01 + GW02_01 + LU02_01 + LB02_01 + GF03_01
(Importance of respective environmental topic)
- c. . WG01_01 + WG01_02 +WG01_03 +WG01_04
(Perceived health)

10. Creating indices by using the arithmetic mean

- a. Index_Importance
- b. Index_Health

Appendix B – Content of the Questionnaire

Wahrgenommene Umwelt in Kamp-Lintfort

- Wie empfinden Sie die Leitungswasserqualität in Kamp-Lintfort?
 - Sehr schlecht — Sehr gut
- Wie schätzen Sie die Grundwasserqualität in Kamp-Lintfort ein?
 - Sehr schlecht — Sehr gut
- Wie empfinden Sie die Luftqualität in Kamp-Lintfort?
 - Sehr schlecht — Sehr gut
- Wie empfinden Sie die Lärmbelästigung durch Straßenverkehr tagsüber in Kamp-Lintfort?
 - Sehr niedrig — Sehr hoch
- Was schätzen Sie, zu welchem Teil Kamp-Lintfort aus Grünflächen besteht?
 - 0% — 100%
- Wie zufrieden sind Sie mit der Anzahl der Grünflächen in Kamp-Lintfort?
 - Sehr unzufrieden — Sehr zufrieden
- Wo sehen sie am meisten Verbesserungspotenzial?
 - Grundwasserqualität Leitungswasserqualität – Luftqualität – Lärmelastigung – Grünflächen
- Welche der folgenden Faktoren schadet Ihrer Meinung nach der Umweltqualität in Kamp-Lintfort am **meisten**?
Ordnen Sie den einzelnen Faktoren die Zahlen 1 (= höchster Schaden) bis 4(= geringster Schaden). Bitte vergeben Sie jede Zahl nur ein mal.
 - ... der Straßenverkehr
 - ... der Eyller Berg (Mülldeponie)
 - ... der Asdonkshof (Müllverbrennungsanlage)
 - ... das ehemalige Bergwerk

Kontrollvariablen

- Wie umweltbewusst schätzen Sie sich selbst ein?
 - Gar nicht umweltbewusst — Sehr umweltbewusst
- Wie wichtig ist Ihnen die Leitungswasserqualität in Kamp-Lintfort?
 - Sehr unwichtig — Sehr wichtig
- Wie wichtig ist Ihnen die Grundwasserqualität in Kamp-Lintfort?
 - Sehr unwichtig — Sehr wichtig

- Wie wichtig ist Ihnen die Luftqualität in Kamp-Lintfort?
 - Sehr unwichtig — Sehr wichtig
- Wie wichtig ist Ihnen Ruhe (bezogen auf Lärmbelästigung durch Straßenverkehr tagsüber) in Kamp-Lintfort??
 - Sehr unwichtig — Sehr wichtig
- Wie wichtig sind Ihnen Grünflächen in Kamp-Lintfort?
 - Sehr unwichtig — Sehr wichtig
- Wie gerne leben Sie in Kamp-Lintfort?
 - Sehr ungern — Sehr gern // – Ich lebe nicht in Kamp-Lintfort
- Wie gerne trinken Sie Leitungswasser in Kamp-Lintfort
 - Sehr ungern — Sehr gern
- Was ist der Hauptgrund dafür, dass Sie (eher) **kein** Leitungswasser in Kamp-Lintfort trinken?
 - Ich trinke Leitungswasser in Kamp-Lintfort.
 - Ich trinke generell kein Wasser.
 - Aussehen (z.B. Trübe)
 - Geschmack
 - Geruch
 - Fehlende Kohlensäure
 - Sonstiges
- Wie würden Sie Ihre aktuelle Stimmung beschreiben?
 - Sehr schlecht — Sehr gut
- Wie gestresst haben Sie sich in den vergangenen sieben Tagen gefühlt?
 - Sehr gestresst — Sehr entspannt

Wahrgenommene Gesundheit

- Wie würden Sie ihren Gesundheitszustand im Allgemeinen beschreiben?
 - Sehr schlecht — Sehr gut
- Wie würden Sie ihren Gesundheitszustand im Vergleich zu anderen Personen in Ihrem Alter beschreiben?
 - Sehr schlecht — Sehr gut
- Wie würden Sie Ihren seelischen Gesundheitszustand im Allgemeinen beschreiben?
 - Sehr schlecht — Sehr gut

- Wie würden Sie Ihren körperlichen Gesundheitszustand im Allgemeinen beschreiben?

Sehr schlecht — Sehr gut

Demographische Fragen

- Alter
 - 1. *Freies Antwortfeld*
- Geschlecht
 - 1. Männlich – Weiblich – Divers
- Wohnort
 - 1. Wohnen Sie in Kamp-Lintfort?
 - Ja – Nein
 - 2. Wenn ja, in welchem Stadtteil wohnen Sie in Kamp-Lintfort?
 - Eyll — Geisbruch — Gestfeld — Hoerstgen — Kamp — Kamperbruch Kamperbrück — Lintfort — Niersenbruch — Rossenray — Saalhoff
 - 3. Seit wie vielen Jahren wohnen Sie bereits in Kamp-Lintfort?
 - *Freies Antwortfeld*
 - 4. Wenn nein, wie oft sind Sie wöchentlich in Kamp-Lintfort?

Seltener als 1 mal – 1 mal – 2 mal – 3 mal – 4 mal – 5 mal – 6 mal – 7 mal

Was hat Ihre Meinung zum ehemaligen Bergwerk in Kamp-Lintfort am **stärksten** beeinflusst?

- Ich habe keine Meinung zum Bergwerk.
- Ich habe selbst dort gearbeitet.
- Mindestens ein Familienmitglied hat dort gearbeitet.
- Befreundete haben dort gearbeitet.
- Die räumliche Nähe zum Bergwerk.
- Sonstiges.

Frage zur LaGa

(Instruktion: Die folgenden Fragen beziehen sich auf die Landesgartenschau (LaGa), die 2020 in Kamp-Lintfort stattfinden wird.)

- Wie schätzen Sie den Einfluss der LaGa auf die Umwelt in Kamp-Lintfort ein?
 - Sehr schlecht — Sehr gut

Appendix C

Table C1. Air quality standards for the protection of health.

Pollutant	Averaging Period	Legal nature and concentration
<i>EU Ambient Air Quality Directives</i>		
PM10	Annual	Limit value: 40
NO ²	1 hour	Limit value: 200
O ³	8 hour	Information threshold: 120
SO ²	1 hour	Limit value: 350
<i>WHO Air Quality Guidelines</i>		
PM10	Annual	20
NO ²	1 hour	40
O ³	1 hour	
SO ²	1 hour	

Notes. All units are $\mu\text{g}/\text{m}^3$. Source: European Commission (n.d.); World Health Organization (n.d.).

Appendix D

Table D1. Mean ratings for the perceived environmental quality in Kamp-Lintfort.

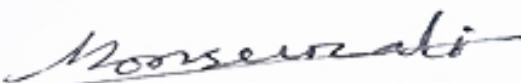
Item	M	SD
1. How do you perceive the tap water quality in Kamp-Lintfort?	69.35	22.611
2. How do you perceive the groundwater quality in Kamp-Lintfort?	54.65	23.424
3. How do you perceive the air quality in Kamp-Lintfort?	68.86	21.408
4. How do you perceive the disturbance caused by traffic during the day in Kamp-Lintfort?	55.42	27.635
5. What do you estimate is the amount of green spaces Kamp-Lintfort consists of	49.31	17.701
6. How content are you with the amount of green spaces in Kamp-Lintfort?	55.83	22.969

Notes. N = 200. Source: own questionnaire.

DECLARATION OF AUTHENTICITY

We, Md Monsur Ali, Michelle Bäck, Maike Bartussek, Christina Freitag, Sanwar Hossain, Md Ashikul Islam, Lisa Kimpel, Marie-Claire Moreno Rabe, Hannah Riedel, Shafaly Roy, Laura Scheller, Lena Schweizer, Katrin Stierle, Anika Wiesel, hereby declare that the work presented herein is our own work completed without the use of any aids other than those listed. Any material from other sources or works done by others has been given due acknowledgement and listed in the reference section. Sentences or parts of sentences quoted literally are marked as quotations; identification of other references with regard to the statement and scope of the work is quoted. The work presented herein has not been published or submitted elsewhere for assessment in the same or a similar form. We will retain a copy of this assignment until after the Board of Examiners has published the results, which we will make available on request.

Kamp-Lintfort, January 25, 2019



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