Short-term rentals and liveability in Dutch cities

Assessment of the relationship between Airbnb listings and liveability and liveability factors in Amsterdam and Rotterdam.

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Abstract

This research has tackled the relationship between short-term rentals and the liveability of neighbourhoods in the Dutch cities of Amsterdam and Rotterdam. Findings are obtained through a literature review, an Exploratory Spatial Data Analysis and a Spearman's rho correlation analysis. It has shown that although short-term rentals can be beneficial from a tourist's perspective, they can also negatively influence liveability. In this work, on the one hand, neighbourhoods with a current high density of short-term rentals have seen an increase in liveability over the 2012 – 2020 period, mainly due to their access to multiple amenities. On the other hand, the main ways short-term rental density can negatively influence the quality of life is through noise nuisance by neighbours, a poorer physical environment and diminished social cohesion.

Keywords: short-term rentals, Airbnb, liveability, quality of life, tourism

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1. Introduction

Since its foundation in 2007 and official launch in March 2008, Airbnb has grown into a major market player in the tourism industry today. As of December 31st 2022, 1.4 million guests have arrived in an Airbnb, across listings in almost every country around the world. They have been welcomed by over 4 million different hosts who since the platform's launch collectively earned over 180 billion US dollars, highlighting its powerful position in the tourism sector today (Airbnb, 2023).

On the one hand, it can be argued that the emergence of the platform has facilitated multiple positive effects. Firstly, from the tourists' perspective, Airbnb has proven to be a great platform for those who want to use household amenities, save money on accommodation or experience a destination in a more authentic local way (Guttentag, 2015). Secondly, on the destination level, destinations can struggle with the negative effects of overtourism when many tourist activities are concentrated in a specific physical space. In such cases, there are more tourists in such space than it can handle according to its carrying capacity. Through Airbnb, listings can appear in neighbourhoods away from the main attractions. According to Koens et al. (2018), strategies that allow a destination to spread its visitors over space and time can be of importance in attempts at sustainable growth, thus highlighting Airbnb's potential with regard to overtourism. However, Celata & Romano (2022), who researched this phenomenon in Italian cities argue that such spread can be counterproductive as well as tourists are now able to penetrate the residential neighbourhoods, changing the structure of the tourist city. Thirdly, in order to increase the sustainability of tourism practices, the benefits gained through tourism should be shared amongst multiple stakeholders, mainly focused on local communities (Roxas et al., 2020). Therefore, it can be argued that platforms of collaborative tourism like Airbnb are able to enhance the sustainability of tourism in a destination as they allow residents to profit directly from tourism. However, the idea that Airbnb is actually able to let the community

directly profit from tourism is rather short-sighted. A report on New York City's, Airbnb activity, for example, shows that Airbnb listings are mostly increasing inequality in the city and its ability to act as a racial gentrification tool (Wachsmuth et al., 2018). Finally, with Airbnb being such a popular platform, destinations are able to profit economically from the growth of Airbnb as well (van Melik & Nieuwland, 2018). With the influx of (inter)national visitors, the tourism sector is able to boost the local economy in many destinations, underlining the importance of good (online) visibility for potential visitors. Therefore, it can be argued that allowing potential visitors to book their stay through popular platforms such as Airbnb, is able to enhance tourism and the economic benefits that can come with that in a destination.

On the other hand, however, multiple destinations also experience negative effects of Airbnb. Many cities, for example, struggle with the liveability of their neighbourhoods due to the influx of tourists through short-term rentals as well as an out-of-proportion significant rise in real estate prices, making it harder for locals to live in the city or neighbourhood that they grew up in (van Melik & Nieuwland, 2018). The opportunity for tourists to experience a destination more 'locally' does not go without risks. According to Goodwin (2017), the stays of tourists in traditionally residential neighbourhoods challenges the social identity of such neighbourhood. Local communities that over time have had to deal with excessive tourism oftentimes feel like the tourists and the city planners that empowered them have ran-down their sense of identity. Finally, destinations struggle with the legal issues that are to do with Airbnb. So are many rentals on the platform operated illegally and are avoiding their tax obligations. Many destinations either lack clear regulations or struggle to enforce their regulations. Moreover, due to hosts on Airbnb renting out 'normal homes', they often avoid zoning laws or other regulations that were originally implemented for the tourism sector (Guttentag, 2015). Eventually, this can lead to pressure on the local community, its services and the real estate market.

It can thus be argued that Airbnb as a platform has the potential to enhance the tourist experience and increase economic revenue. However, the practice has shown that, in reality, the rapid rise in popularity of this platform has caused multiple overtourism problems in different destinations, mostly to do with liveability, the real estate market and legislation. Therefore, this research aims to answer the following research question:

"To what extent does the spatial distribution of Airbnb listings in major Dutch cities relate to the liveability of its neighbourhoods?"

In order to answer this question, the current debates in the literature regarding Airbnb and overtourism will be presented. Consequently, an Exploratory Spatial Data Analysis through GIS will show the spatial distribution of Airbnb listings and different overtourism indicators in the cities of Amsterdam and Rotterdam, the Netherlands. The research will look into the distribution and density of Airbnb listings on the smallest neighbourhood level to determine the existence and strength of the possible relationships with liveability indicators. Here, a comparison will be made between the two biggest cities of the Netherlands, one which hosts relatively many tourists and one which hosts a relatively small number of tourists. The following sub-questions are formulated to help answer the main research question:

RQ1*: What are the main liveability components and how can short-term rentals contribute to these?*

RQ2: *What are the regulations for Airbnb and how have these changed over time in the two major Dutch cities?*

After presenting the main overtourism indicators, an Exploratory Spatial Data analysis through GIS followed by a correlation analysis will be conducted to look into the spatiality of the cities' Airbnb listings and their overtourism indicators. Hence, the third, fourth and fifth sub-questions are:

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RQ3: *What is the spatial distribution of Airbnb listings in the two major Dutch cities?*

RQ4: *What is the spatial distribution of liveability indicators in the two major Dutch cities?*

RQ5: *How does the density of Airbnb listings in a certain neighbourhood correlate with its liveability indicators?*

In the following chapter, a literature review will be presented on theories regarding Airbnb and liveability, the main liveability components, and an overview of legislation with regard to Airbnb in the study area. In doing so, the first two sub-questions will be answered. In the third chapter on the methodology of this research, the data collection process and the data analysis will be presented. Consequently, the results section will present the findings obtained through maps and correlation analysis to answer the other sub-questions. These findings will be given meaning in the following discussion section, applying the aforementioned literature to the context of Amsterdam and Rotterdam. Finally, in the concluding chapter, the main research question will be answered which will be followed by a reflecting chapter discussing the study's strengths, limitations and recommendations for further research.

2. Theoretical Framework

2.1 Defining overtourism

Generally speaking, overtourism can be defined as a large and unorganised arrival of tourists to a popular destination. In such destinations, the locals or visitors feel like there are too many visitors and the quality of life or the quality of the tourist experience has deteriorated significantly (Cheung & Li, 2019). It is important to recognise that there is a difference between overtourism and the overcrowding of popular destinations as overcrowding does not necessarily entail overtourism. When talking about overtourism, a certain threshold is reached where the number of tourists overwhelms the available services and facilities and with that becomes a disturbance for the residents of such locations (Butler, 2018). Therefore, the most important thing to take into account when defining overtourism is the perceptions of the actors. Overtourism is not necessarily defined by a number of people or limited to popular destinations but defined by the possible inconvenience for inhabitants or the deteriorated experience of tourists (Verissimo et al., 2020). Based on their research on the Gamcheon Culture Village in South Korea, Kim & Kang (2020) argue that overtourism is a result of poor treatment of residents in throughout the whole tourism development process. As shown in Figure 2.1 below, anti-tourist perspectives should be addressed in the early stages of tourism development and take into account how a certain development can influence the daily life of the residents. Currently, the focus is on the moment in time when the damage is already done and has led to

an explosion of irritation whereas destinations could be able to prevent to reach this point if it had been addressed earlier.
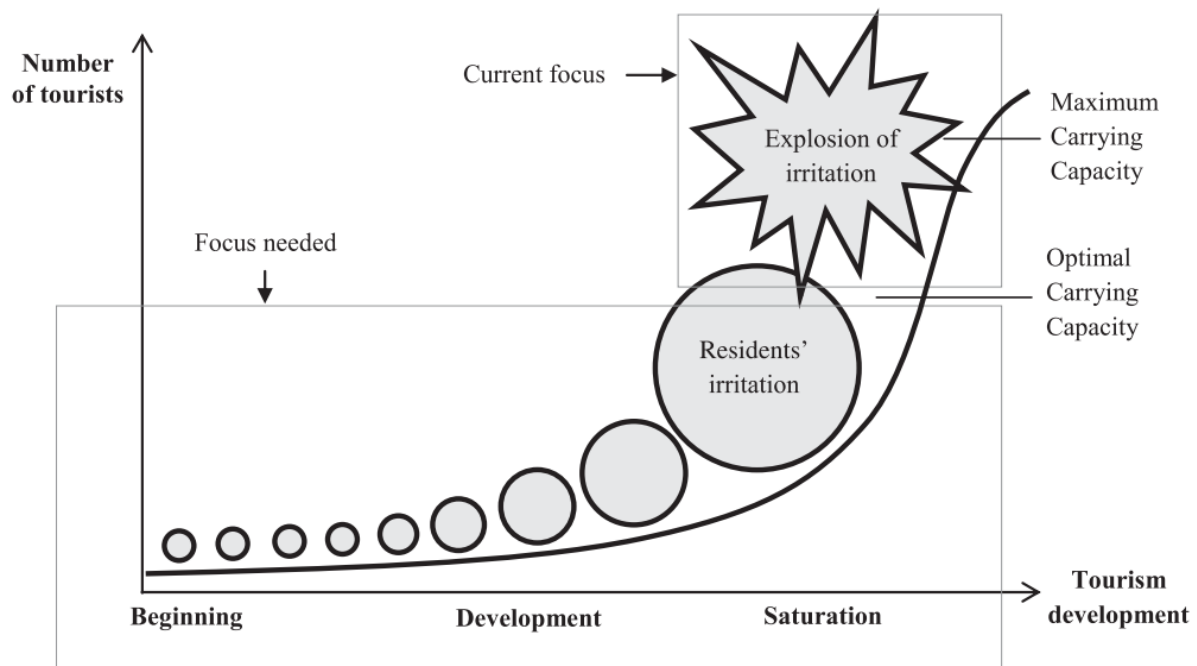
Figure 2.1: The process of anti-tourist perspectives as a result of being an over-tourist destination (Kim & Kang, 2020 (based on the tourism life cycle model of Butler (1980) and the snowball theory of Page (2014))

Although the concept of STR might suggest it to be a mitigating factor to overtourism as it allows the tourist to spread more over space, recent research suggests otherwise. For example, the increasing popularity of STR platforms has allowed tourists to infiltrate residential neighbourhoods, deteriorating the liveability in those areas (Furukawa & Onuki, 2022). Antunes & Ferreira (2021) came to similar results in Lisbon, Portugal, stating that a high concentration of such rentals can lead to multiple different externalities that negatively impact its liveability.

2.2 The rise of online short-term rental platforms

Ever since the foundation of the short-term rental platform Airbnb, which matches the hosts and the guests of such rentals, the popularity of renting such places rose. Short-Term Rentals (STR) can be defined as the renting out of a furnished property for a shorter period of time, often less than one month (Furukawa & Onuki, 2022). Although only launched in 2008, Airbnb has developed itself as a major market player in the tourism industry. Garcia-Ayllon (2018) sees the beginning of an exponential growth of Airbnb listings in popular destinations in Spain when developing a trend analysis, seeing the main growth in the most recent years of the analysis, between 2015 and 2018. Moreover, although published before the COVID-19 pandemic, he argues that the number of listings on Airbnb could multiply by a factor of four between 2018 and 2025 in main cities. Due to its explosive growth, Airbnb can be viewed as a disruptor of traditional markets in the tourism sector (Zervas et al., 2017). The disruptive innovation model by Gerber & Matthee (2019) in Figure 2.2 suggests that, initially, the disruptive technology scores significantly lower on the key attribute compared to the sustaining technology. However, the disruptor also offers multiple other attributes that the sustaining technology does not offer, which makes the disruptive technology rise in popularity. In the tourism industry, hotels can be seen as the sustaining technology for overnight stays.
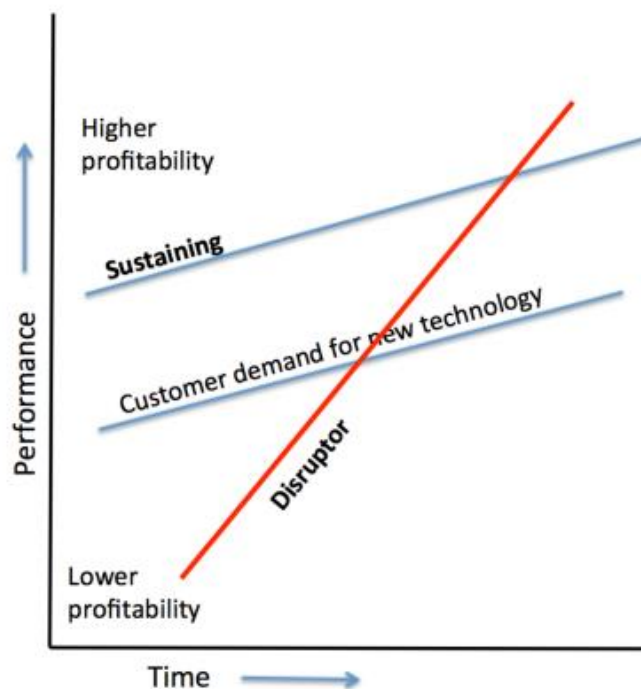

Figure 2.2: Disruptive innovation model (Gerber & Matthee, 2019).

Airbnb, however, is the disruptor here. Airbnb listings, at first,

scored lower on key attributes such as cleanliness and comfort. Nonetheless, the other attributes that are offered through Airbnb such as local experiences, household amenities and saving money empowered Airbnb to disrupt the sector (Guttentag, 2015). Fairly quickly, Airbnb was able to adapt and improve the traditional attributes of the accommodation sector as well. Research in 2017 showed that with regard to these key attributes, Airbnb is already outperforming budget hotels while underperforming upscale hotels (Guttentag & Smith, 2017).

The sudden rise of STR through online platforms has also empowered multiple issues related to overtourism and the unsustainable urban transformations that this initiated (Garcia-Ayllon, 2018).

2.3 The relation between short-term rentals and liveability indicators

Whereas most cases of overtourism were limited to the places that were geographically located close to the most popular tourist attractions, the rise in popularity of STR through Airbnb has allowed these to spread throughout the residential neighbourhoods as well. Therefore, such rentals have been criticised as they have been able to deteriorate the liveability in residential neighbourhoods (Furukawa & Onuki, 2022).

2.3.1 Liveability as an overarching concept

In recent years, more and more locals voice their discontent with Airbnb in their neighbourhoods as they feel like it has a negative effect on the liveability of the neighbourhood. A recent example of this can be found in the Dutch beach village of Cadzand close to the Belgian border. Inhabitants state that during low season, the town turns into a ghost town, as many houses are vacant during that period. However, when the season starts, many cars show up at each house, having to park in the street and increasing noise nuisance as the tourists are

enjoying their holidays. They argue that all this happens at the expense of social cohesion and the liveability of the village (Omroep Zeeland, 2022).

Complaints on Airbnb like this are not unique to this village as criticism of liveability factors like neighbourhood changes, nuisance and the increase in rents and housing prices are extensive (Nieuwland & van Melik, 2020; Oskam & Boswijk, 2016). So did Füller & Michel (2014) in their work focus on the Berlin neighbourhood of Kreuzberg where after 2010 many neighbourhood changes happened as tourists wanted to stay in the neighbourhood for an authentic experience. Amenities changed from working-class pubs to middle-class coffee shops to alter this new form of tourism. Cócola-Gant (2016) focused more on the processes of gentrification powered by STR. He argues that the growth of rental platforms like Airbnb has led to a new form of gentrification. Short-term visitors are prioritised over long-term residents leading to a replacement of residential life by tourism. Therefore, the rise of STR mediated by digital platforms has allowed liveability to decline through different factors. This section presents the relationship that STR has on such factors such as rising rents, displacement, the human pressure on public space and noise pollution.

2.3.2 Rising rents and housing prices

In theory, the renting of vacant apartments during touristic periods can be a way of reducing the efficiency losses in a destination. However, when homeowners use platforms like Airbnb to shift their rental from long-term for residents to short-term for tourists, the supply market for long-term rentals for residents is reduced, eventually increasing the rents and housing prices (Garcia-López et al., 2020).

This increase in rents and housing prices has been observed in different contexts before, such as Barron et al. (2021) researching listings in the entire USA and Garcia-López et al. (2020)

researching the city of Barcelona, Spain. In their work on Airbnb in the United States, Barron et al. (2021) identified two main ways in which Airbnb listings can increase rents and housing prices. The first way, similar to the work by Garcia-López et al. (2020), is the increasing appeal for landlords to switch from long-term rentals to residents to short-term rentals to tourists. This way, the long-term supply pool is reduced and the increase in rents is exploited in the housing prices. The second way is that owning Airbnb listings directly increases housing prices as landlords are able to obtain an income from the excess housing supply. Therefore, the benefit of owning property compared to renting increases and, with that, increases both housing prices and rents as well (Barron et al., 2021).

2.3.3 Displacement

The aforementioned rise in rents and housing prices powered by STR through Airbnb can eventually lead to processes of gentrification and displacement of original residents. Wachsmuth & Weisler (2018), use the rent gap model to explain this theory. This rent gap model highlights the moment when the economic returns of the properties are either stagnating or declining while the potential economic returns keep growing, creating a gap between the potential and actual economic returns. Therefore, in neighbourhoods where this gap is consistently increasing, it becomes more and more interesting for potential landlords to invest. These new investment flows consequently initiate processes of gentrification, where the housing prices increase, attracting more wealthy people while displacing the poorer original residents. Cocola-Gant & Gago (2020) add to this by challenging the statements made by Airbnb, as the platform claims that their hosts are regular residents that allow visitors to live like a local in their apartments. Their findings, however, show that the platform has shown to be an extra incentive for buy-to-let investments where the hosts are professional developers, landlords and investors while displacing the locals.

2.3.4 Human pressure on public space

Although the number of tourists is growing in many destinations, this absolute number is not necessarily the reason for concern for many inhabitants. However, the increasing penetration of these tourists into the residential neighbourhoods is what concerns many (Celata & Romano, 2022). This influx of visitors leads to increasing pressure on public space. An interviewee in the research by Lestegás et al. (2019), who researched the city of Lisbon, stated that the city is becoming a theme park. Multiple local businesses are disappearing and the public space is getting congested leading to a harder daily life. Similar findings were found in the qualitative work by Cocola-Gant (2023), who interviewed long-term residents of the Barcelona city centre and stated the loss of public space and local facilities. Changes in the public space make people feel like they cannot use their streets anymore. An example given here can be found in the popular Gòtic neighbourhood. This area is one of the oldest in the city and therefore has narrow streets and limited public space. Nevertheless, the neighbourhood is among the most visited in the city and is filled by companies that rent out bikes or scooters. Therefore, the already narrow streets are not only filled by many walking visitors but by those using these vehicles as well. A result of this is a worsening situation regarding mobility, especially for population groups such as the physically impaired, elderly and children.

2.3.5 Noise pollution

One of the most important factors that negatively influences the liveability is noise pollution. This entails all different kinds of noise and includes noise made by people, parties in STR and nightlife as well (Cocola-Gant, 2023). This noise disruption caused by tourists is one of the main annoyances of the inhabitants of the Berlin neighbourhood Kreuzberg, which saw a rapid increase in tourists over the last decade. They described that tourists made noise from the wheels of their suitcases to newly opened bars and open-air parties in the residential neighbourhood (Füller & Michel, 2014). Especially the latter is something that is seen in multiple destinations

with a high spread of STR as noise pollution is linked with party tourism and low-cost tourism. In his research employed in Barcelona, over three-quarters of the participants stated to be either dissatisfied or very dissatisfied with the level of noise. The tourist often sees the neighbourhood as an entertainment space while not paying attention to the residential function it has as well. Moreover, residents feel like local authorities are very tolerant of visitors and their night-time activities, not being strict enough to enforce the rules they might break. Most of the participants stated that the noise pollution makes the neighbourhood a disturbing place to live in, therefore negatively impacting its liveability (Cocola-Gant, 2023).

2.4 Evolution of the regulatory frameworks of STR in the major Dutch cities

The Dutch tourism industry is healing after tourist arrivals plummeted during the COVID-19 pandemic. In the third quarter of 2022, Dutch hotels, camp grounds, holiday parks and group accommodations welcomed 14.6 million visitors. This is 15 percent more compared to the same period in 2021 but, more importantly, 4 percent more than the same period in 2019 before the lockdown for the pandemic in early 2022. Especially hotels in the big cities regained their international visits with Amsterdam and Rotterdam reporting a growth 130 and 65 percent respectfully compared to the same period in 2021 (CBS, 2022a). However, due to the difficulties in truly measuring good data on STR, this data provided by the Dutch Statistics Office did not include the number of stays in STR. However, the share of Airbnb accommodation is identified as an indicator for overtourism by Peeters et al. (2018) who researched overtourism throughout the European Union. Along this, the tourism density and intensity, the growth of bed-nights combined with intensity, the share of tourism contribution to GDP, the air travel intensity and the closeness to airports, cruise ports and World Heritage Sites are seen as key indicators. According to these indicators, it is to be expected that the Dutch

cities are prone to overtourism, especially Amsterdam due to its high intensity of tourist activity. Moreover, both cities are easily reachable both through airports and cruise ports and include multiple World Heritage Sites either within or close to the city. When the moment of overtourism is reached, this does not only mean a deteriorating tourist experience but a decrease in liveability for the residents as well (Cheung & Li, 2019).

As aforementioned, the rise of STR has empowered the tourist to settle into the residential neighbourhoods, transforming the way of life. In multiple popular destinations residents more and more feel like their quality of life has worsened, calling for regulations by their government (Furukawa & Onuki, 2022). For a long time, there were no clear regulations regarding STR in the Netherlands. This changed on the first of January, 2021 as a new law passed on the rental of homes for tourists. On their website, the central government states that everyone should be able to rent out their homes to tourists but that this should not cause any nuisance or problems for home seekers. The new law gives municipalities more opportunities to enforce STR. However, the municipalities can decide themselves if and to what extent they want to make use of this law (Rijksoverheid, 2021).

2.4.1 Case of Amsterdam

Before the implementation of the new law regarding STR of 2021, there was a lot of uncertainty for hosts, guests and residents. Especially in Amsterdam, a city that is rather popular on online STR platforms, people were not happy as the rules were often changing in a short amount of time as the bureaucratic world was constantly behind on developments regarding STR. These platforms were operating in a grey zone when it comes to jurisdictions. The Dutch Council of State, for example, pronounced in early 2020 that a short-term rental license was needed while the municipality of Amsterdam stated that they were partly going to tolerate those who operated without one (NOS, 2020). With the help of the aforementioned new law, the city of Amsterdam now has clearer legislation. Hosts now have to register their listing to the municipality and have

to apply for a permit that has to be renewed every year. The most notable part of this legislation, however, is that hosts are allowed to rent out their home for only 30 nights a year unless they have received a special short-term rental permit which allows them to rent it out for more nights (Airbnb, 2021).

2.4.2 Case of Rotterdam

In Rotterdam, the rules are slightly different but based on the same national law. Although hosts in Rotterdam need to register their listing to the municipality as well, they do not need to apply for a permit, contrary to those in Amsterdam. On their website, the municipality of Rotterdam state that the home is clearly intended for the host's own habitation and not just for short-term rental. Hosts are obliged to report the number of nights they rent out their home in advance and their rentals cannot cause any nuisance to their neighbours. When such nuisance is reported by neighbours, research will be started which can lead to fines or closure of the listing if it shows that the host has not tried their best to avoid such nuisance. Finally, like in Amsterdam, the city of Rotterdam allows its hosts to rent out their homes for a fixed number of nights per year as well. In Rotterdam, this number is considerably higher at a maximum of 60 nights per year (Gemeente Rotterdam, 2022).

3. Methodology

In the first chapter, the topic of the research was introduced as the rapid rise in the popularity of Airbnb calls for more research in the fields of tourism and human geography. It introduced the effects it can have on a city such as deteriorating liveability, loss of identity and legal issues. The second chapter, went more in-depth on these topics, providing an understanding of how Airbnb listings contribute to problems regarding overtourism and how the cities of Amsterdam and Rotterdam have tried to deal with this. This chapter discusses the research strategy, data collection methods and data analysis process in order to explore the ways in which the spatial distribution of Airbnb listings can relate to overtourism indicators in Amsterdam and Rotterdam.

3.1 Research strategy

This work uses a case study, as this research method is helpful to understand phenomena more in-depth or in a specific context (Taylor, 2016). As aforementioned, the municipalities of Amsterdam and Rotterdam are the two largest municipalities regarding the number of citizens in the Netherlands, housing over 882 thousand and over 655 thousand people respectively (CBS, 2022b). However, the popularity of tourists visiting the Dutch capital of Amsterdam over Rotterdam becomes apparent in the number of Airbnb listings. During 2022, 6998 different listings were posted in Amsterdam, while this number was significantly lower at 848 in Rotterdam (Inside Airbnb, 2022). Even when converting this to the number of city residents, Amsterdam has about six times as many listings per thousand inhabitants compared to Rotterdam. Therefore, this study can be classified as a comparative case study. It looks for both similarities and differences in the spatial distribution of its Airbnb listings and its possible relations with different overtourism indicators.

Next to Amsterdam and Rotterdam, two big cities with relatively many and relatively few tourists, it would be interesting to look at the effect of Airbnb listings in a smaller city with

relatively many tourists as well. However, due to the availability of high-quality data on Airbnb listings, this research is limited to the aforementioned cities. This work, thus, uses a comparative case study as it aims to answer the main research question: "To what extent does the spatial distribution of Airbnb listings in major Dutch cities relate to liveability indicators?".

To answer this question and its sub-questions, multiple research methods were used. Triangulation combines data about a similar topic that is collected through different methods in order to increase the trustworthiness of the research (Taylor, 2016). This research, therefore, aimed to use this and combine a literature review, the real-life cases of Amsterdam and Rotterdam and a GIS and statistical analysis. Here, a literature review is used to answer the sub-question: "What are the main liveability components and how do Airbnb listings contribute to these?". This helped to understand the different dimensions of liveability and the way STR can influence these. To get an overview of how STR is being regulated in the Netherlands, there is looked into the specific cities in the second sub-question: "What are the regulations for Airbnb and how have these changed over time in the two major Dutch cities?". Moreover, a GIS analysis will be used to answer the questions: "What is the spatial distribution of Airbnb listings in the two major Dutch cities?" and "What is the spatial distribution of liveability indicators in the two major Dutch cities?". This way, a visualisation is created of the spatiality of liveability and its components in the study area. Finally, the GIS analysis will be combined with regression analysis to answer the final sub-question: "How does the density of Airbnb listings in a certain neighbourhood correlate with its liveability indicators?". An Exploratory Spatial Data Analysis using GIS can be beneficial to discover potential clusters and in discovering and visualising spatial patterns (Wilson, 2016). Moreover, to answer the sub-questions, secondary data was used. Secondary data is not only able to contribute to a study by providing relevant context, but it is helpful when comparing context-specific findings to theory as well. It allows the researcher to place their findings into a broader context and place it into the academic debate. Especially

when researching phenomena on a rather large scale, such as the two biggest cities of the Netherlands, using secondary data can be advantageous. Here, census data provided by government institutions and Airbnb listings data provided by a private company allow us to look at this phenomenon on a larger scale but with a lot of precision, something that is impossible to acquire by a single researcher (Tyrrell, 2016). Although the research is strengthened by the scale that the data was collected in, it is limited due to the time period it was collected in as well. The only data that was publicly available over a significant period of time was that of the relative liveability, which is collected in both 2012 and 2020. For the other data, such as liveability components or Airbnb listings, only the most recent dataset is publicly available. Therefore, the only evolution to be analysed over time is that of relative liveability whereas for the others, a single point in time is analysed.

3.2 Data collection

3.2.1 Literature review

As abovementioned, this research has used a literature review to gain insight into the relevant concepts and the connections between them. The chapter discussed relevant articles in the field which were primarily found using search engines such as Google Scholar and Scopus. Here, the relevant search terms were entered into the search field, and the relevance was checked by reading their abstracts. This literature review was performed in order to offer an overview of the themes related to the topic. Additionally, it responded to the sub-questions that aimed at determining the contribution that Airbnb listings can have on liveability and provided an overview of Airbnb and its regulations in Amsterdam and Rotterdam.

3.2.2 Spatial data

Multiple types of spatial data were used in this research to answer the sub-questions focused on the spatial distribution of Airbnb listings, the spatial distribution of liveability, liveability indicators and how the density of the listings relates to this. As visualised below in Table 3.1, different sources are used to obtain different sets of data. Here, the data on Airbnb listings is provided by the Inside Airbnb project, a private project aimed at providing data about the impact that Airbnb has on residential communities (Inside Airbnb, 2023). All other spatial data such as neighbourhood borders, demographics, liveability and liveability factors have been downloaded from different Dutch governmental institutions and are all publicly available online. This allows the research to have the highest precision possible due to the high number of respondents that have been generated through census data. At the same time, this research is also limited by the data that is available. Although the data provided by the Dutch government has good coverage throughout the country, the data on Airbnb listings are rather limited, restricting the research to the cities of Amsterdam and Rotterdam. At the same time, the only data that was available on the smallest neighbourhood level over an extended period of time was that of relative liveability, therefore allowing to compute the difference between the two given years.

Table 3.1 Data used in GIS analysis

Data	Reference year	Source
Neighbourhood borders and demographics	2023	Statistics Netherlands (CBS)
Airbnb listings	2022	Inside Airbnb
Development of relative liveability per neighbourhood	2012 & 2020	Leefbaarometer (Ministry of Internal Affairs)
Relative liveability components (housing stock, physical environment, amenities, social cohesion, nuisance and insecurity)	2020	Leefbaarometer (Ministry of Internal Affairs)
Extreme noise nuisance by neighbours	2020	National Institute for Public Health and the Environment (RIVM)

When looking at the data on liveability provided by the Dutch Ministry of Public Affairs, two main factors need to be taken into account. Firstly, the data they provide on this scale level is relative to the Dutch average and are defined in terms of standard deviations. Generally speaking, the Netherlands is one of the countries scoring highest according to different liveability score charts. Therefore, a neighbourhood might be very liveable but consequently, scores negatively compared to the Dutch average. Secondly, as shown in Figure 3.1, the Dutch Ministry of Internal Affairs computes their liveability score based on five different components: the housing stock, physical environment, amenities, social cohesion and nuisance and insecurity that all contribute in a
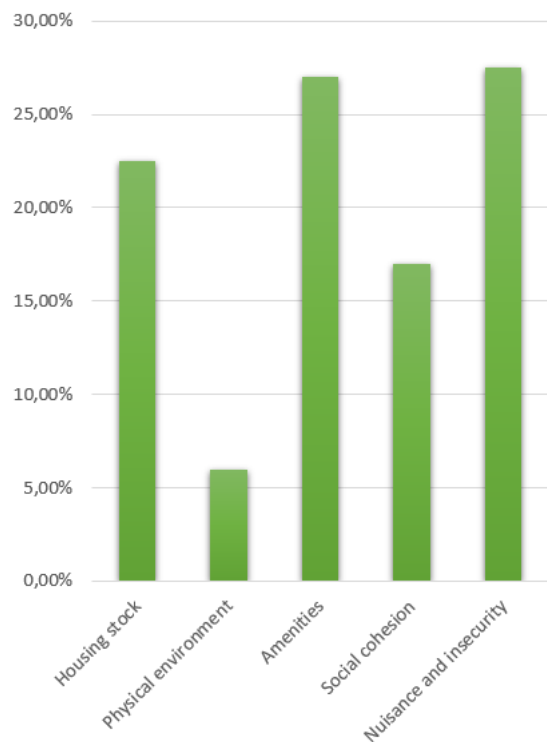

Figure 3.1: Weight of components in liveability score (Leefbaarometer, 2020; translated by author).

different weight to the final statistic. Therefore, having the statistic for these different components allows the research to not just look at liveability on its own but also explore the effect of STR on its different components

3.3 Data analysis

Using an Exploratory Spatial Data Analysis, the spatial distribution of Airbnb listings and overtourism indicators in both cities were visualised. By doing this, it aims to display the regions in the city that experience the most listings as well as their vulnerability to different overtourism indicators.

The GIS process started by making a coherent and complete dataset for all the neighbourhoods. The dataset that provides the polygon data already provides many columns of data on different things in that neighbourhood, many of which are unnecessary for this research and needed to be deleted for practical purposes. As this dataset included all the neighbourhoods in the Netherlands, all neighbourhoods in Amsterdam and Rotterdam were selected, and using the 'save selected features as' tool, a new layer with just the two cities' neighbourhoods was created. The main challenges in creating a complete dataset have to do with most of the datasets only being downloadable as a Microsoft Excel file, where a file needed to be downloaded including the liveability score of every neighbourhood in the Netherlands. Therefore, scores given for every neighbourhood outside of Amsterdam and Rotterdam needed to be deleted. Data on the extreme noise nuisance by neighbours was able to download for specific cities while only available as a Microsoft Excel file as well. These tables were added to the GIS file and joined to the other neighbourhood dataset through the common value of the neighbourhood code.

The process of determining Airbnb density in a neighbourhood was rather straightforward. By using the count points in polygon tool, a new value was created for every neighbourhood

displaying the number of Airbnb listings. Consequently, this number was divided per hectare of land the neighbourhood is made out of. In the original data, there is already a distinction made between the total surface area, the surface area of land and the surface area of water in a neighbourhood.

After this, a full dataset was created where every neighbourhood, on the smallest possible Dutch neighbourhood level, had a value for relative Airbnb listings, liveability, and liveability indicators. Consequently, this dataset was used in a Pearson's r correlation analysis where the relative Airbnb listing density was seen as the dependent variable and tested against the liveability components.

However, due to the nature of the data, there were some methodological issues in relating Airbnb listings with the evolution of liveability as well. Firstly, the scores given to each neighbourhood are projected as a standard deviation compared to the Dutch average. Here it is important to note that, compared to scores globally or even in the global west, the Netherlands is often to be found as one of the countries with the highest quality of life, slightly differing depending on the index. Therefore, an absolute score that is generally considered very liveable can be displayed as a negative score as it scores lower than the average Dutch neighbourhood. Secondly, this relative score makes it a bit harder to interpret findings on the development of this liveability score between 2012 and 2020. For example, the absolute liveability in a neighbourhood in Amsterdam or Rotterdam could have stayed the same but due to developments in the Netherlands, the liveability outside the big cities may have decreased causing an increase in relative liveability in the city or vice versa. Finally, only the final relative liveability score was collected in both 2012 and 2020. This research also builds on the five components of liveability that the Dutch Ministry of Internal Affairs has adopted in their liveability score but since those values are only available in the latest version of the data it was not possible to examine its development over time.

4. Results

4.1 Descriptive statistics

Presented in Table 4.1 below are the descriptive statistics of the neighbourhoods that were eventually included in the statistical analysis. In some neighbourhoods, mainly those that consist of the Rotterdam harbour, no or limited data was available, leading to the exclusion of those neighbourhoods in the analysis. As the Table displays, the listings per hectare of land in each neighbourhood were used as the dependent variable. It shows that the city of Amsterdam has substantially more listings per surface area of land with the mean score per neighbourhood in Amsterdam laying higher than the maximum score per neighbourhood in Rotterdam.

Table 4.1 Descriptive statistics of the number of listings per hectare of land per neighbourhood in researched cities.

	Listings per hectare of land	
	Amsterdam	Rotterdam
N	479	92
Mean	1.189	0.123
Std. Deviation	1.568	0.218
Minimum	0	0
Maximum	8.714	1.131

This difference in Airbnb listing density also becomes apparent in Figure 4.1 below. Although all values are relatively low in Rotterdam, the highest values are found in the city's centre. In Amsterdam, relatively many listings can be found all around the city with the highest values in or west or south of the historic centre.
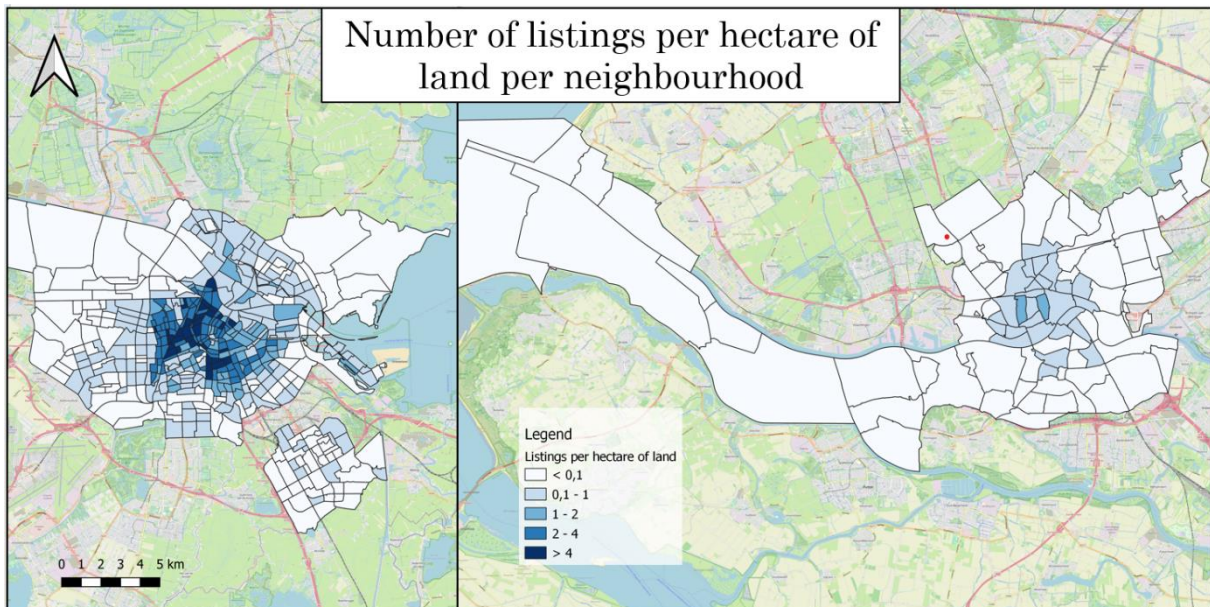

Figure 4.1: Number of listings per hectare of land per neighbourhood in Amsterdam (left) and Rotterdam (right)

4.2 Liveability components in researched cities

As mentioned in the methodology chapter, the Dutch Ministry of Internal Affairs calculated its liveability score based on five different components: the housing stock, physical environment, amenities, social cohesion and nuisance and insecurity. All these scores, however, are published as a standard deviation relative to the Dutch average. Figure 4.2 below presents the relative housing stock score. The main difference here between the two cities is that the low-scoring neighbourhoods in Amsterdam are located mostly on the outskirts of the city whereas these can be found in the city centre in Rotterdam as well.

When looking at the scores for each neighbourhood for its physical environment we see very uniform scores around both cities. As shown in Figure 4.3, almost every neighbourhood scores very close to the national average with some of the poorer scorer neighbourhoods being located on the outskirts of the city or north of the IJ river in Amsterdam.
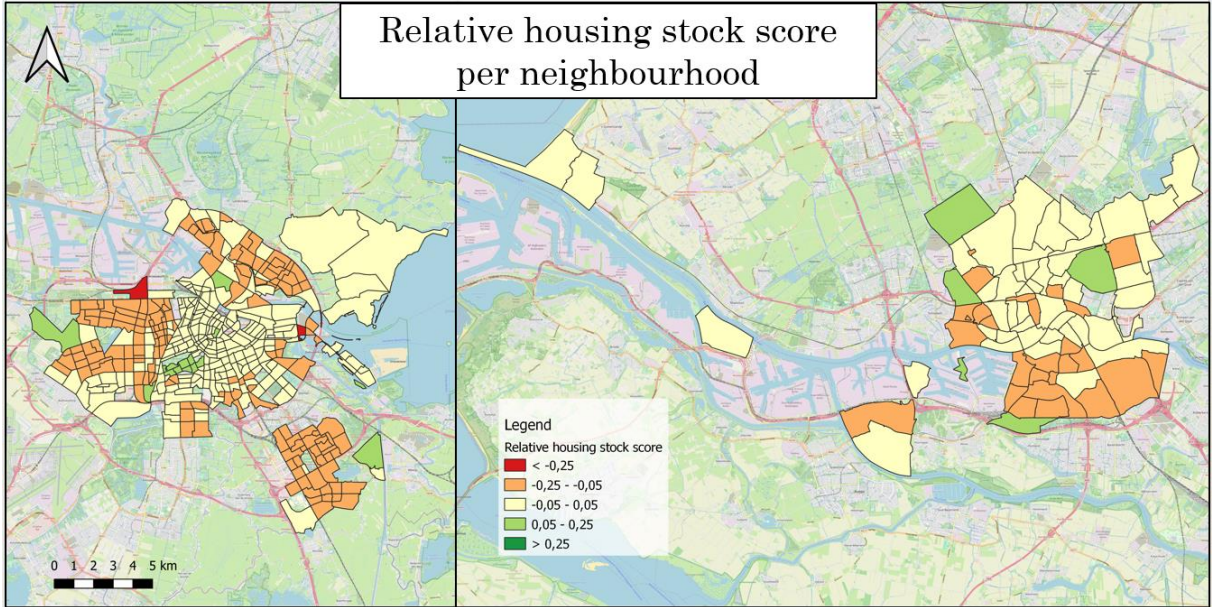

Figure 4.2: Relative housing stock score per neighbourhood in Amsterdam (left) and Rotterdam (right).
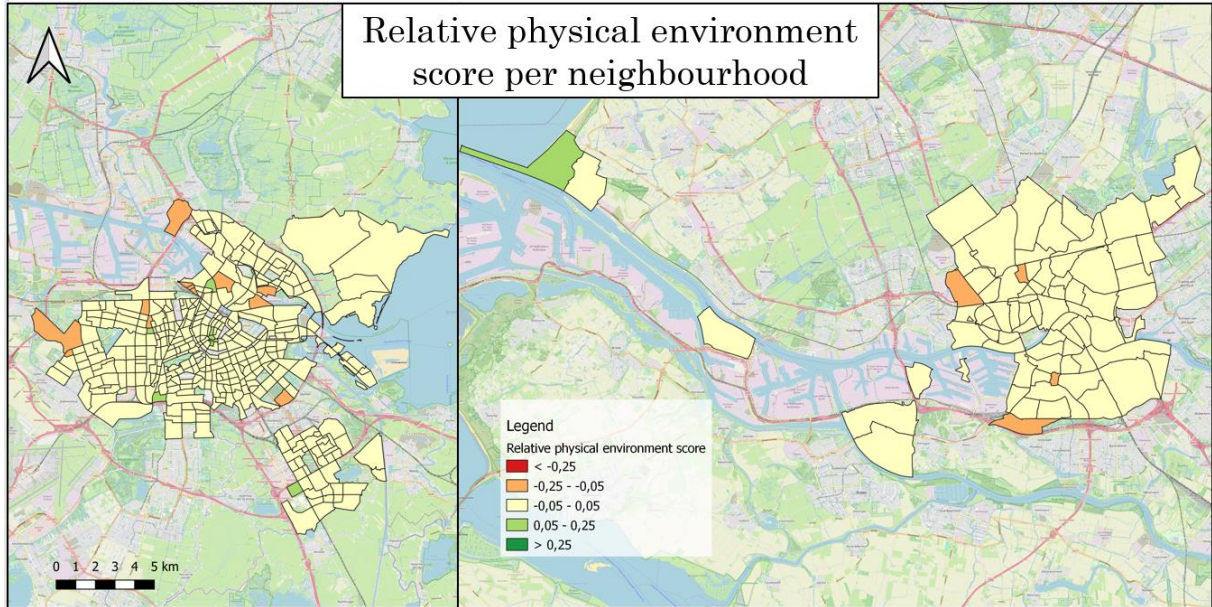

Figure 4.3: Relative physical environment score per neighbourhood in Amsterdam (left) and Rotterdam (right).

More extreme results can be found when looking at the relative amenities score per neighbourhood. As the two biggest cities of the Netherlands are being researched it could be unsurprisingly that most neighbourhoods score considerably higher than the Dutch average. As displayed in Figure 4.4, in both cities, the spatial spread is similar with most amenities to be found in the city centre, scoring lower the further away from the centre.

When looking at Figure 4.5 on the social cohesion score, a similar dispersion appears as well. However, here it seems that those neighbourhoods located more towards the centre of the city score lower for their social cohesion while the neighbourhoods with a relatively high social cohesion score are located on the outskirts.

This reoccurring spatial pattern between the inner city and its outskirts seems to not be so apparent when looking at the relative nuisance and insecurity score. As shown in Figure 4.6 below, the low-scoring neighbourhoods can be found all around the city. However, the high-scoring neighbourhoods seem to appear in the neighbourhoods with relatively few inhabitants.
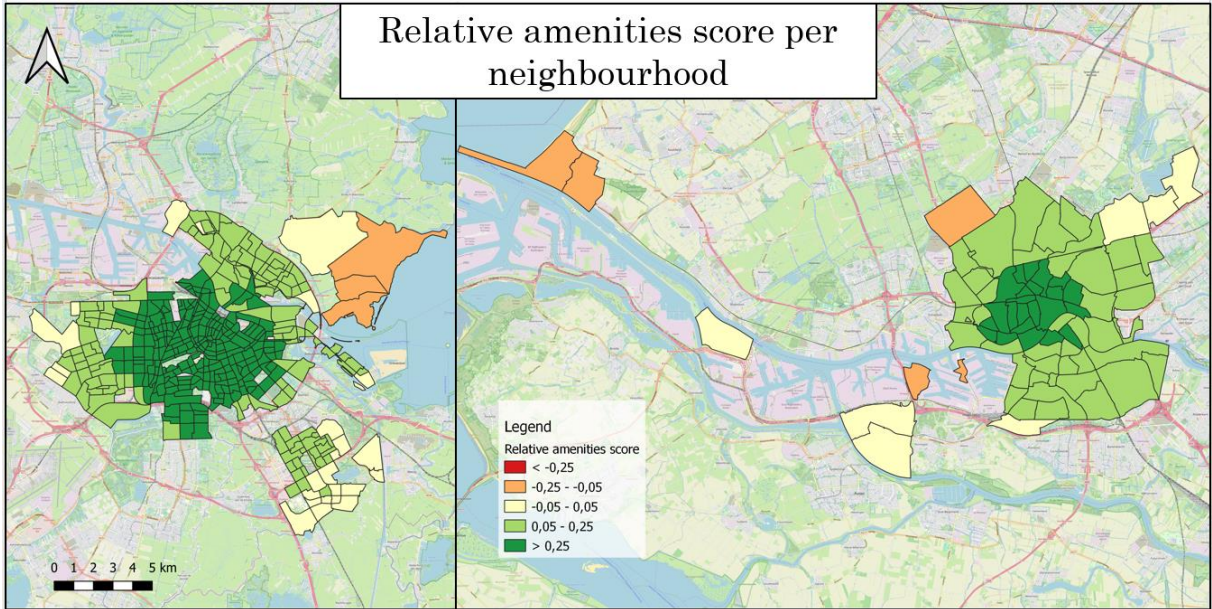

Figure 4.4: Relative amenities score per neighbourhood in Amsterdam (left) and Rotterdam (right).
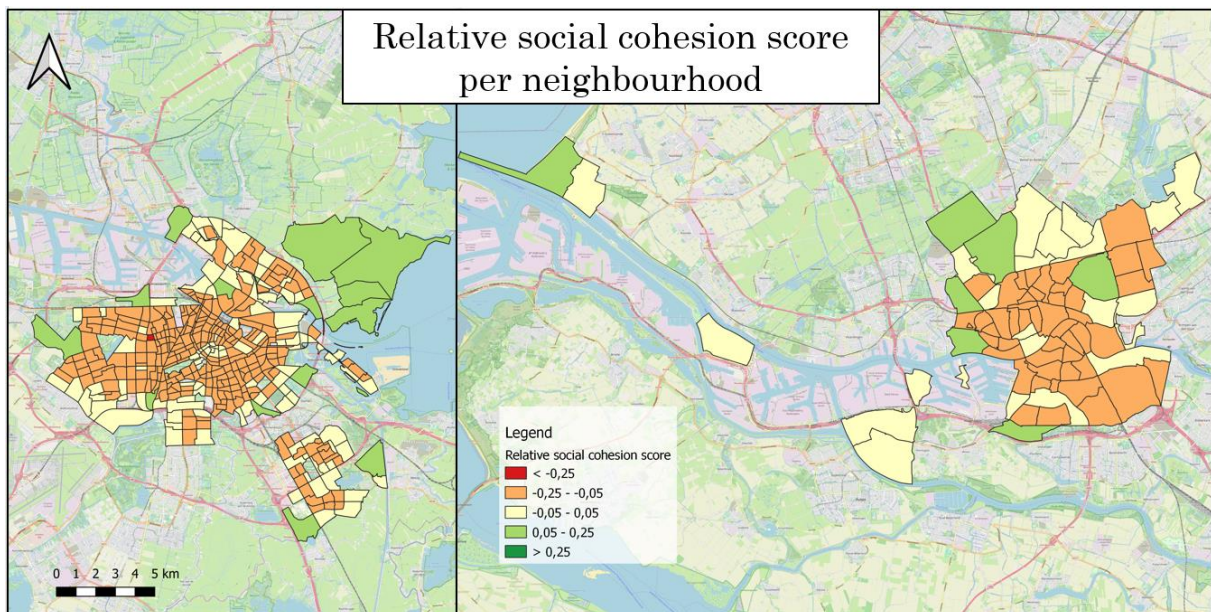
Figure 4.5: Relative social cohesion score per neighbourhood in Amsterdam (left) and Rotterdam (right).
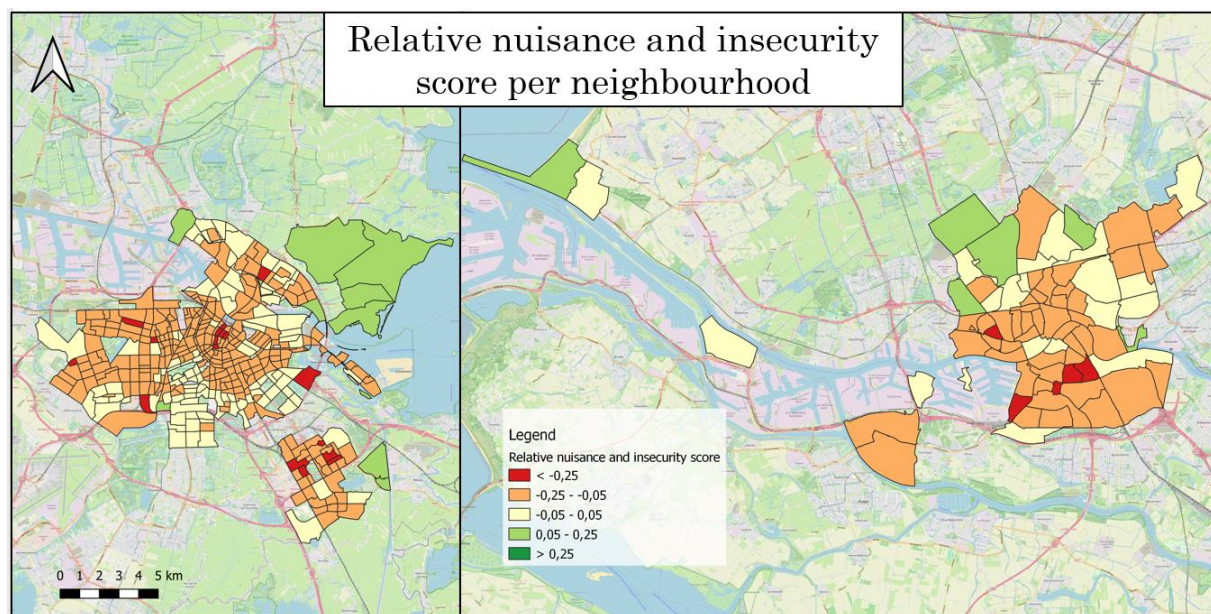
Figure 4.6: Relative nuisance and insecurity score per neighbourhood in Amsterdam (left) and Rotterdam (right).

Next to the components of liveability provided by the Dutch Ministry of Internal Affairs that are presented above, the Dutch National Institute of Public Health and the Environment provided data on extreme noise nuisance by neighbours as well. It shows the percentage of inhabitants per neighbourhood that experiences extreme noise nuisance by their neighbours. As

can be seen in Figure 4.7, this percentage is relatively spread out throughout the cities, with a very high score in a Rotterdam neighbourhood located in the city's harbour.
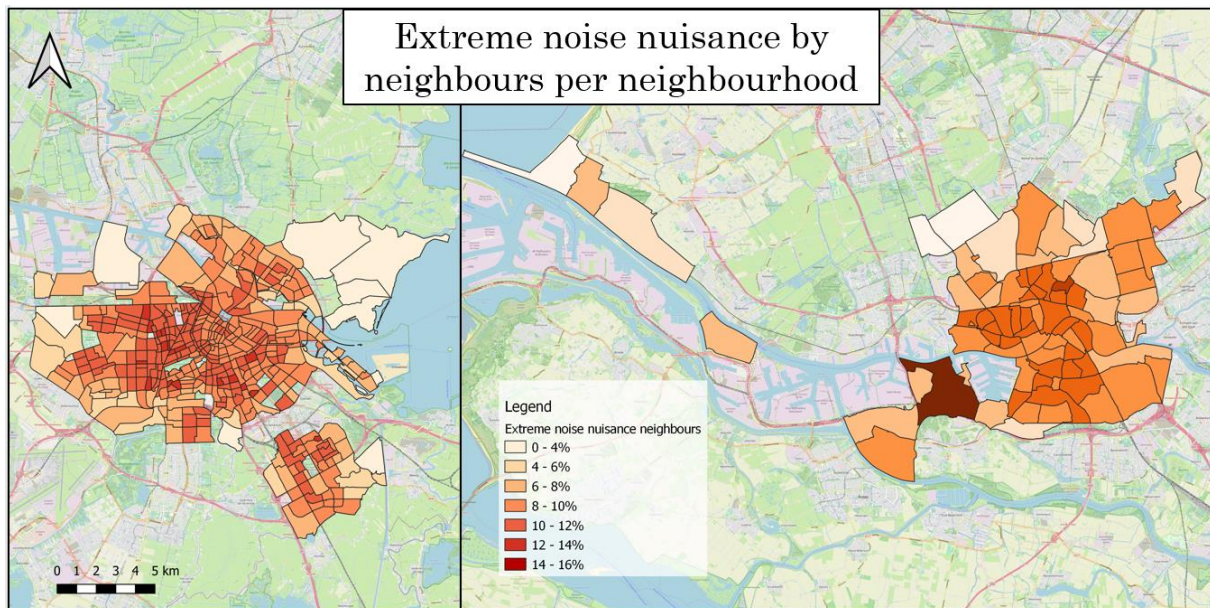
Figure 4.7: Extreme noise nuisance by neighbours per neighbourhood in Amsterdam (left) and Rotterdam (right).

4.3 Liveability in researched areas

The aforementioned scores of different liveability components form a liveability score together, assigning a different value for each component. Figure 4.8 below shows the relative liveability of each neighbourhood compared to the country's average. In Amsterdam, it shows the main positive deviation in and south of the city's centre while the main negative deviations can be found in the south-eastern neighbourhoods of the Bijlmer. In Rotterdam, the two neighbourhoods with a positive deviation are located in the northwest while neighbourhoods scoring negatively are located south of the Meuse River.

Due to this data being published in both 2020 and 2012, a new statistic of its development could be computed. Although differences seemed minimal at first, after zooming in on these differences, interesting patterns could be discovered, as displayed in Figure 4.9. In Amsterdam, for example, it shows that the main positive developments can be found right outside the city

centre while in the city centre itself, both neighbourhoods with a relative increase and decrease in liveability can be found. Moreover, most of the neighbourhoods with negative development can be found on the outskirts of the Dutch capital. In Rotterdam, most of the relative positive development can be found in the centre of the city whereas most of its negative development takes place in the south of the city.
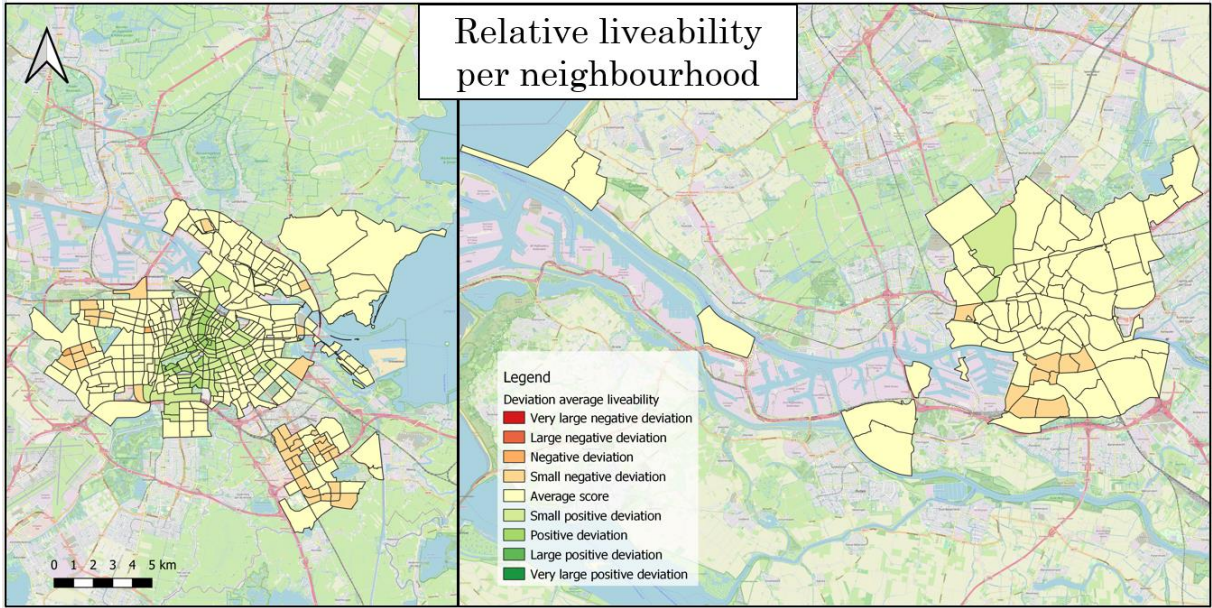

Figure 4.8: Relative liveability per neighbourhood in Amsterdam (left) and Rotterdam (right)
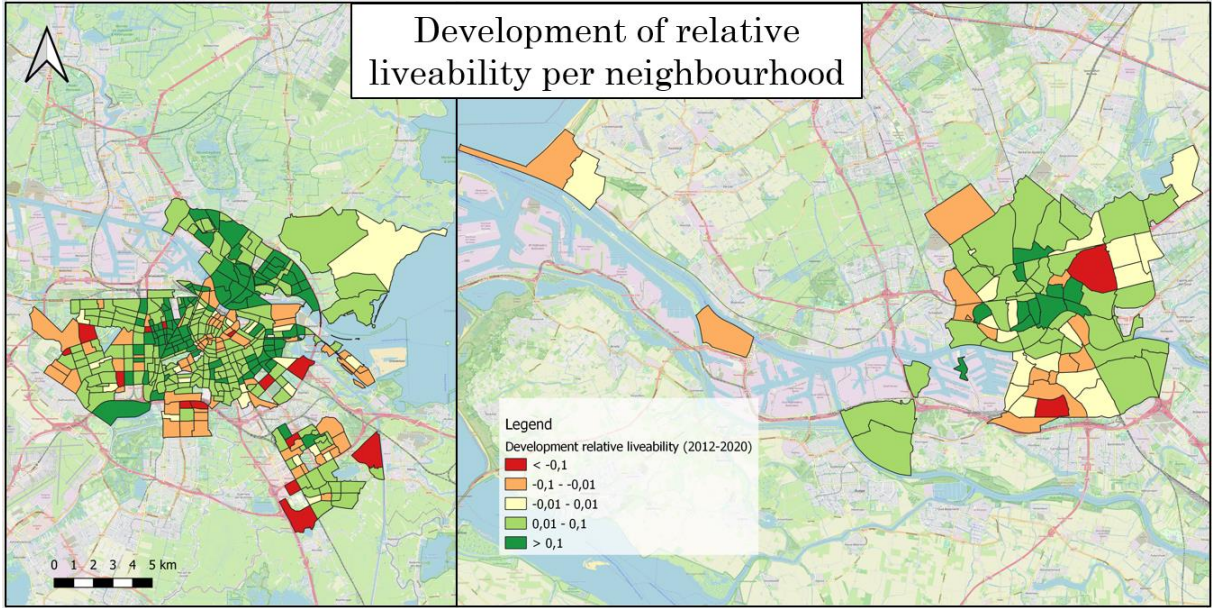

Figure 4.9: Development of relative liveability per neighbourhood in Amsterdam (left) and Rotterdam (right).

4.4 Correlations

This chapter has so far looked into the spatiality of liveability and the components that make this up in the cities of Amsterdam and Rotterdam. To find out how this correlate with the intensity of Airbnb listings in a neighbourhood, this research adopted a Spearman's rho correlation analysis. Here, the number of listings per hectare of land in a neighbourhood, thus excluding bodies of water such as lakes and canals, was used as the dependent variable while the liveability and its components were used as the independent variables.

The output of this, which can be seen in Table 4.2 below, shows multiple significantly relevant correlations. Strikingly, showing a statistically significant for each independent variable in at least one of the two researched cities. It is interesting to see that this is the case given the fact that tourism and STR is way more popular in Amsterdam than in Rotterdam. Still, in Rotterdam a significant correlation was found between the Airbnb listing density and six out of the eight independent variables while in Amsterdam seven out of eight were statistically significant. Moreover, for the variables were a significant correlation was found in both cities, the strength of this correlation is stronger in Rotterdam, suggesting a slightly bigger effect of STR on liveability.

Whereas for multiple variables a significant correlation can be found in both cities, for the relative liveability, the housing stock score and the nuisance and insecurity score a significant result can be found in one of the cities where this is not apparent in the other. What is also remarkable, is that it shows a positive correlation between the intensity of Airbnb listings and the development of liveability in both cities, suggesting that liveability has increased over the 2012 – 2020 period in the neighbourhoods that have a higher number of Airbnb listings in 2022. Taking the discussed literature into account, one could at first expect a deteriorating liveability in the neighbourhoods with a higher Airbnb listing density. However, it is important to recognise that it is impossible to present a complete picture with the data available.

What is interesting about the used data, is that the scores of the different components allow the research to get a more precise insight into such findings that seem surprising at first. For example, it shows that the most extreme correlation is between Airbnb density and the amenities score, which has a high weight for the final liveability score, showing values of 0.801*** and 0.815*** for both cities. However, it shows negative correlations of -0.214*** and -0.297** for the physical environment score and -0.427*** and -0.646*** for the social cohesion score respectively, suggesting that the physical environment and the social cohesion in a neighbourhood are lower in the neighbourhoods that have a higher density of Airbnb listings. Moreover, it shows positive correlations of 0.488*** and 0.563*** regarding the percentage of people in a neighbourhood that experience extreme noise nuisance by neighbours implying more nuisance to occur in neighbourhoods with a high density of listings.

Table 4.2 Spearman's rho correlation number of Airbnb listings per land surface area and relative liveability (components) score

		Number of Airbnb listings per hectare of land	
Variable		Amsterdam	Rotterdam
Development relative liveability (2012-2020)	Spearman's rho	0.241***	0.381***
	p-value	< .001	< .001
Relative liveability (2020)	Spearman's rho	0.644***	0.200
	p-value	< 0.001	0.078
Relative housing stock score	Spearman's rho	0.431***	-0.004
	p-value	< 0.001	0.971
Relative physical environment score	Spearman's rho	-0.214***	-0.297**
	p-value	< 0.001	< .008
Relative amenities score	Spearman's rho	0.801***	0.815***
	p-value	< 0.001	< .001
Relative social cohesion score	Spearman's rho	-0.472***	-0.646***
	p-value	< 0.001	< .001
Relative nuisance and insecurity score	Spearman's rho	-0.029	-0.341**
	p-value	0.565	0.002
Extreme noise nuisance by neighbours	Spearman's rho	0.488***	0.563***
	p-value	< 0.001	< 0.001

*p < .05, **p < .01, ***p < .001

4.4.1 Associations and expectations

Generally speaking, the positive correlation between listing density and the development of relative liveability is not in line with the leading literature on the topic. However, it is important to recognise different factors which could cause such findings. Firstly, as aforementioned, the number of amenities is a main contributor to liveability in the used dataset. Unsurprisingly, these can be found in the centre of the city which are often the most attractive areas for tourists

to settle and for Airbnb's to open. Therefore there can be a possibility that the amenities are not there to accommodate the people staying in the Airbnb listings but that the Airbnb listings are there because the amenities make it an attractive area. Secondly, the model uses relative liveability compared to the average country. Therefore, if the liveability in the city stays the same but decreases in the countryside, it will show a relative increase in the city, thus implying that there are many factors the model does not account for.

Associations found regarding the physical environment, social cohesion and noise nuisance are in line with previously discussed literature. For example, in different contexts, both Cocola-Gant (2023) and Füller & Michel (2014) came to the conclusion that many people experience noise disruption by partying tourists, more and more in residential neighbourhoods. It thus was unsurprising to see the negative significant correlation between the Airbnb listings and the extreme noise nuisance by neighbours variable. The loss of quality of the physical environment was to be expected as well, as tourists are increasingly found in residential neighbourhoods that are not designed for tourists, making it harder to use in daily life (Celata & Romano, 2022; Cocola-Gant, 2023). The notion of a loss in social cohesion in a neighbourhood when tourists infiltrate the residential neighbourhoods has been cited by Dutch medium Omroep Zeeland (2022) before, who reported on a small beach village filled with STR. For parts of the year, residents live without neighbours and whenever new people move in they are gone before they get to know them, negatively impacting social cohesion. However, what is striking is that these correlations can be found in both cities but are even stronger in Rotterdam. Taking into account the descriptive statistics of this research in Table 4.1, is the fact that the highest listing density score in Rotterdam is lower than the average density score in Amsterdam. This would suggest a relatively smaller impact on the liveability compared to the Dutch capital. Especially when thinking about the correlation with extreme noise nuisance by neighbours, you could expect it to be more apparent in a tourism driven city like Amsterdam. However, also here it is important

to take the definition of overtourism into account as it is not just based on an absolute number of tourists. The perceptions of the people are most important as it is defined by the hindrance in daily life by the residents or the worsening tourist experience (Verissimo et al., 2020).

Moreover, an important effect of high STR density in neighbourhoods mentioned in relevant literature is the increased risk of displacement through rising rents and housing prices (Barron et al., 2021; Garcia-López et al., 2020; Cocola-Gant & Gago, 2020). In this research, this association could not be tested as the Dutch Ministry of Internal Affairs did not account for this component in their liveability score. Although they did include the housing stock as one of their components, this factor is about the number of owner-occupied and rental properties that are suitable for residential use, not the affordability of them.

5. Discussion

As discussed in the previous section, not all findings are in line with the discussed literature. So was the association with the relative liveability development in general positive and were some associations significant in one city while they were not in the other. For example, its association with the relative nuisance and insecurity score was insignificant in Amsterdam while it was negative and significant in Rotterdam, implying that neighbourhoods with a higher density of Airbnb listings in Rotterdam experience less nuisance and insecurity. However, when looking at its correlation with the extreme noise nuisance by neighbours data, a significant positive correlation is found as the literature would suggest (Cocola-Gant, 2023; Füller & Michel, 2014). Since the term liveability can be rather big and complex, it was helpful to look into the associations with different components of liveability as well as this allowed to better explain the initial findings on relative liveability and its development.

5.1 Liveability, short-term rentals and urbanity

While the previous section discussed the findings in line with the discussed literature it is important to look at factors that were not taken into account in the tested model. For example, when looking at the significant correlations of Table 4.2, its connections with urbanity in general should be taken into account as well. It is rather unsurprising that a significant positive correlation has been found between the listing density and the amenities score as in general, these central areas have many amenities and are most attractive for hosts to run their rental out of. In the same manner, it is to be expected that urbanity has had a significant role in the correlation between Airbnb density and the pressure on the physical environment as more people use less space compared to less urbanised areas regardless of their Airbnb listing density. Moreover, although a positive correlation between listing density and noise nuisance by neighbours was to be expected based on previously discussed literature (e.g. Füller & Michel, 2014; Cocola-Gant, 2023), the positive correlation here can be due to its location in the urban

centres as well. It is to be expected that those who have more neighbours living close by can experience more noise nuisance than those with fewer neighbours. Finally, this goes with the correlation found between the listing density and social cohesion as well, where a decrease in social cohesion was found in the neighbourhoods with a higher Airbnb density. This negative correlation was to be expected based on a news article in a popular beach destination in the Netherlands where residents felt like the social cohesion in the neighbourhood had worsened after many homes were converted into short-term rental spaces (Omroep Zeeland, 2022). At the same time, this finding can be supported by its urban characteristics as well. For example, as stated by Mouratidis & Poortinga (2020) in Oslo, lower social cohesion is found in the more vibrant, high-density neighbourhoods.

5.2 Finding balance through regulation

This research has shown that the number of short-term rental listings in a neighbourhood can impact the liveability for the residents in multiple different ways. The work focused on the association between the current Airbnb listing density and its current liveability components and relative liveability over time per neighbourhood in Amsterdam and Rotterdam. However, due to the data of Airbnb listings only being available of 2022, it is not possible to say much about the impact of the regulations that have been enforced in both cities of the years. Therefore, this research has looked into the association between the current Airbnb density and its current liveability components and relative liveability over time. When making proper regulation, it is important to take the different things that short-term rentals can influence into account. Its impact on liveability is a rather complex phenomenon that does not just revolves around impacts on the housing market or the pressure on public space. Therefore, regulations should be aimed at finding a balance between offering tourists an alternative way of accommodation compared to its traditional forms, while avoiding a significant drop in quality of life for the residents. As discussed in the second chapter, it would be better to have more

guiding regulations to be applied relatively early in the tourism development process to prevent tourist numbers from exceeding the tourist carrying capacity in the first time. This entails that especially in Rotterdam, there is more room for guidelines that can limit the possible rise of STR in the city whereas in Amsterdam more harsh guidelines are needed to reduce the negative effects that come with a high number of STR.

6. Conclusion

Through the assessment of the relationship between Airbnb listings and liveability and liveability factors in Amsterdam and Rotterdam, this study provided an overview of this complex relationship. The main research question was: *"To what extent does the spatial distribution of Airbnb listings in major Dutch cities relate to the liveability of its neighbourhoods?".* Each of the sub-questions will be covered in this concluding chapter, and then the main research question will be addressed. Finally, this chapter will offer some suggestions for further research.

The first sub-question looked into the main liveability components and how STR can contribute to these. It showed that a high density of STR listings is able to negatively impact the social cohesion in a neighbourhood, increase human pressure on public space, lead to more noise pollution and increase the risk of displacement through rising rents and housing prices.

By answering the second sub-question, an overview was given about the regulatory frameworks in the Netherlands and the major cities. Here, a new law that passed on the first day of 2021 on the rental of homes for tourists was vital, allowing municipalities more chances to enforce STR. Nowadays, hosts in both cities have to register their listing to their municipality. Hosts in Amsterdam have to apply each year for a permit as well and can rent out their home for a maximum of 30 nights a year whereas those in Rotterdam have a maximum of 60 nights a year.

Displaying the areas with the highest Airbnb listing density was the aim of the third sub-question. Here it became clear that in both cities, the highest densities can be found in the city centre. Moreover, it shows the difference in density between the two cities where the neighbourhoods with the highest density in Rotterdam can be seen as rather low density in Amsterdam.

The fourth sub-question looked into the spatial distribution of the liveability indicators and shown that their distribution is very much dependent on the specific variable. For example,

some components are rather clearly distributed away from the city centre whereas others seem to be more randomly distributed. For the relative liveability score, the best scores in Amsterdam can be found in and south of the city centre while the lower-scoring neighbourhoods are found on the outskirts of the city, mainly in the southeast or the west. In Rotterdam this is less clear, the two neighbourhoods with a positive deviation are located in the northwest while neighbourhoods scoring negatively are located south of the Meuse River.

The statistical correlation between the Airbnb listing density and the liveability indicators for each neighbourhood was addressed in the final sub-question. In both cities positive significant correlations were found between the Airbnb listing density and the relative amenities score and the percentage of people experiencing extreme noise nuisance by their neighbours, entailing that people who live in a neighbourhood with many listings have more amenities close by and experience more noise nuisance. Moreover, significant negative correlations have been found in relation to the relative physical environment score and the social cohesion score meaning that in neighbourhoods with relatively more listings, the physical environment is relatively worse and social ties are weaker.

The main research question aimed to find out to what extent the spatial distribution of Airbnb listings in Amsterdam and Rotterdam relates to the liveability of its neighbourhoods. It has shown that STR can negatively influence liveability in multiple different ways with associations found in this case study between the listing density and noise nuisance by neighbours, worsening physical environment and weaker social ties. A positive correlation has been found between the listing density and the development of the relevant liveability, meaning that in the neighbourhoods that have a relatively high density of Airbnb listings in 2022, the relative liveability had increased over the 2012 – 2020 period. However, explaining this correlation in detail as well as those of the individual components and the effect of the regulations unfortunately goes beyond the scope of this research.

It has shown that destinations are able to offer tourists the possibility of a more genuine stay by experiencing the destination through the eyes of a temporary resident rather than a visitor through STR. However, here it is important to avoid or limit the annoyance for the residents. To reach this, it is important to start early in the tourism development process with thinking about how you want to develop as a destination and taking the liveability of the current residents into account. STR should be a vital part of tourism policy as it has more effect on residents daily life than other forms of tourism. Whereas traditional tourist activities are often located in spaces designed to handle high numbers of visitors, residential neighbourhoods are not made to handle this new type of tourist.

Although the dataset used can be seen as a strength of this work as it was able to provide the research with high quality data on the smallest neighbourhood level for multiple liveability indicators, it was one of its limitations as well. Firstly, the only data that was available over time was of the relative liveability score which can be influenced by processes happening outside of the study area. Secondly, there was no neighbourhood level data on the housing market, making it impossible to look at the effects of STR on housing affordability as part of liveability. Thirdly, the data on Airbnb listings was only available in 2022, and not over a longer time period, making it impossible to look if an increase or decrease in listings has an effect on neighbourhood liveability. Moreover, the analysis was rather exploratory as it was only possible to research the correlations between the factors and not the causality as well as it was not able to use control variables. Generally speaking, this case study was not able to mimic the methods used in other research making it hard to compare findings here with those in other literature. Taking all this into account, it would be interesting for further research to dive deeper into the topic and find out what change in liveability components are being caused by a high density of STR and which are happening because of urban processes of general. Moreover, it would be

interesting to compare the findings of big cities like Amsterdam and Rotterdam with findings in small villages that experience a lot of tourism such as Giethoorn or Volendam.

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