# Reducing the Environmental Impact of **Airbnb** Properties

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Wageningen University & NHTV Breda 29/06/2017

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# Abstract

This study addresses a pioneer of the sharing economy in the tourism industry, Airbnb. The question answered is "(How) do Airbnb hosts reduce the environmental impact of their properties, and what is the role of Airbnb in this?". This was answered through researching Airbnb from the supply side on two layers – Airbnb as the platform provider, and Airbnb hosts as the providers of their properties. The answer was found through an analysis of questionnaires filled out by Airbnb hosts and content analysis of Airbnb's official website, user-generated data on two platforms, and listings in Amsterdam. Results show whether and how these two actors engage in environmentally sustainable practices to reduce the negative environmental footprint caused by Airbnb's existence and use. Possibilities to expand these practices were found and are further elaborated in the discussion. The study found that Airbnb's current level of interference in reducing the environmental impact caused by users of the platform is low, while some hosts take measures to address this environmental impact voluntarily. The suggestions show a large potential to increase Airbnb's role in environmental sustainability in tourism. Since further expansion of Airbnb is expected, its environmental impact needs to be addressed.

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# 1 Introduction

In the past decades, many online marketplaces based on the sharing of services have emerged. Airbnb is an example of such a company. It finds itself in the so-called sharing economy, which has increased in popularity in the 21<sup>st</sup> century. The advancements of the Internet, such as Web 2.0, provided a platform which enabled the exponential growth of the online sharing economy. The concept of sharing has now become a big part of the tourism industry and the impacts of the sharing economy have become an even more important area to study, as the current generation of travelers, the millennials, were "programmed to borrow, rent and share" (Geron, 2013, p. 1).

Airbnb is a pioneer and one of the best-known examples of the sharing economy in the tourism industry (Ert, Fleischer & Magen, 2016). It is an online platform with the main purpose of enabling the sharing of accommodations between hosts and guests around the world. Ever since it was founded in 2008, it has been experiencing exponential growth, with the end to its expansion not being on the horizon yet (Ert, Fleischer & Magen, 2016). According to data published by Airbnb, the platform is used in over 191 countries, with over 160,000,000 guests and 3,000,000 listings (Airbnb, n. d. a). Alongside Airbnb's increasing success, a lot of controversies have surfaced. Airbnb is being scrutinized over many economic points such as unfair advantage (Kalinowski, 2017), tax evasions (Baker, 2014), which have caused challenges for the hotel industry (Zervas, Proserpio & Byers, 2014). Effects on neighborhoods and citizens are also under discussion. Negative perceptions such as having strangers in local residencies (Logan, 2015), increased housing prices (ING, 2016; Booth, 2015), or fading of culture and destruction of neighborhoods (Pickell, 2016) seem to put Airbnb's advantages into shade. Dilemmas, such as whether Airbnb will bring overall benefits or disadvantages to the tourism industry emerged as well (Fang, Ye & Law, 2016).

Since Airbnb's growth has not yet reached its full potential, more people will choose Airbnb on their travels meaning that, quite likely, a larger market will be created. The study by Nowak et al. (2015) showed Airbnb has already created a new market, as four percent of Airbnb travelers would not have travelled if it was not for Airbnb. The question is, whether the negative perceptions of Airbnb will be counterfeited, or keep increasing. The negative environmental impact of Airbnb is yet unspoken of, and has so far only been quantified by a

study requested by the platform itself. This study showed that compared to hotels, Airbnb listings have a lower negative environmental impact (Cleantech Group, 2014). However, the environmental impact of hotels is typically larger than the impact of other similar sized buildings (Bohdanowicz, 2006) and less than half of Airbnb users substitute from traditional hotels (Nowak et al., 2015). The question is thus whether the lower environmental impacts found by the Cleantech Group (2014) are intentional and worked for, or an externality.

In addition to the growing market, the importance to study the environmental impact of Airbnb lays in the fact that even those who do not participate in the actions of Airbnb are affected by it. The sharing economy has already been researched from socio-economic perspectives (Nadler, 2014). Individual hosts gain economic benefits (Geron, 2013) through renting out spare rooms or homes and both hosts and guests gain social advantages, such as meaningful connections (Walsch, 2011) or a stronger sense of community (Botsman & Rogers, 2011). However, the environmental footprint caused by Airbnb affects the entire society, whether or not they are a part of the Airbnb community, and is yet to be studied.

It is thus the environmental impact of Airbnb that is researched in this thesis. This was analyzed through a two-layer perspective of the supply side of Airbnb, looking at hosts that offer their rooms on the platform and Airbnb as the marketplace. I aimed to find out whether or how Airbnb hosts try to influence the negative environmental impacts caused by renting out their properties, and whether or how Airbnb sets any environmental standards or incentives to ensure or incentivize a more environmentally friendly tourism provision. The last aim was to see whether there is any unfulfilled potential on this platform to promote environmentally sustainable practices. To find out more, the following research question was asked: *(How) do Airbnb hosts reduce the environmental impact of their properties, and what is the role of Airbnb in this?* To make the main research question viable, the following specific research questions (SRQs) were answered:

# SRQ1: What measures do Airbnb hosts take to reduce the environmental impact of their properties?

- SRQ2: What is Airbnb's role in the measures taken by hosts to reduce the environmental impact of their properties?
- SRQ3: Where does the potential of reducing environmental impacts of Airbnb properties lay?

By answering these questions, I explore whether and how Airbnb hosts (try to) reduce the environmental impact caused by renting out their properties to Airbnb guests, and whether the company Airbnb sets any incentives or standards to minimize this impact. A literature review providing a thorough review of the existing knowledge on the concepts necessary for the suggested analysis follows after the introduction. The concepts of Web 2.0, the sharing economy, Airbnb, sustainability and environmental management are reviewed. The data necessary for the analysis and results was collected through questionnaires and from three online textual sources: Airbnb's official website, user-generated content of Airbnb hosts and listings of properties. To get more valid results from the analysis of the listings, a single case study of Amsterdam was chosen. Indicators for the analysis of the environmental performance of properties were identified and according to these, the collected data was analyzed through content analysis and descriptive statistical analysis. The results are then discussed and lastly, main points are summarized in the conclusion. All in all, this thesis provides a base for the existing gap on environmental sustainable tourism provision by Airbnb.

# 2 Literature Review

The following section provides information on the existing literature on Web 2.0, the sharing economy and Airbnb, which is useful to understand the concept studied in this thesis. It then expands on the concept of sustainability, what drives sustainable behavior and how this can be implemented in an organization.

# 2.1 Web 2.0

The development of Web 2.0 on the Internet allowed for the rise of the online sharing economy. Simply put, Web 2.0 refers to websites with user-generated content (e.g. Bingley, Burgess, Sellitto, Cox & Buultjens, 2010; Hepburn, 2007; Gretzel, 2006). More characteristics of Web 2.0 are cost-effective scalability of services, increase of content richness with increase of users, users as co-developers, shared intelligence, customer self-service, software usable on different devices, unimportant interfaces and development/business models (O'Reily, 2005). Tourism 2.0 is a concept related to this, as it takes on the characteristics of Web 2.0 in a tourism setting (Schmallegger & Carson, 2008).

Tourism 2.0 is quite new to tourism literature and is interchangeably referred to as Travel 2.0. Web 2.0 enables potential consumers with online platforms to research, design and book their trip (Hepburn, 2007). These Internet based platforms can be used as information sources by tourists (Xiang & Gretzel, 2010). Litvin, Goldsmith and Pan (2007) find that word-of-mouth, which is comparable to online user generated content, is an important information source, particularly in the tourism industry because consumers are unable to evaluate a service before consumption. The trustworthiness of user generated content is considered higher than in traditional tourism information sources such as guides and travel agencies (Akehurst, 2009). It also provides feedback opportunities and better understanding of guests' needs (Dellarocas, 2003) and can be used as a marketing tool (Kumar, 2011; Hays, Page & Buhalis, 2013).

### 2.2 Sharing Economy

The sharing economy is a development of earlier forms of peer-to-peer online platforms (Web 2.0) like eBay or Craigslist. The difference between the earlier platforms and current sharing economy platforms is that the early ones are associated with sales of goods, while

sharing economy marketplaces offer services (Ert, Fleischer & Magen, 2016). The new online marketplace is composed of individual consumers and sellers, that create transactions between each other. These transactions are enabled by a third party (Botsman & Rogers, 2011). The business model of a sharing economy organization is shown in figure 1. Even though the sharing economy was not created though Web 2.0, this advance on the Internet enabled its rapid expansion (Forno & Garibaldi, 2015).



Figure 1. Sharing economy company's business model, (Juul, 2015).

Online platforms are growing at a fast rate (Pizam, 2014) and have thrived in the tourism sector (Ert, Fleischer & Magen, 2016; Juul, 2015; Pizam, 2014). Thanks to advances in ICT, tourism has become relational, peer-to-peer and user-generated (Forno & Garibaldi, 2015). Examples of sharing economy in the tourism industry include Uber, Eatwith, Vayable and Airbnb (Ert, Fleischer & Magen, 2016). On the one hand, the sharing economy enables travelers to reach a better price-quality ratio than with traditional tourism providers and allows for more flexibility (Juul, 2015). On the other hand, however, it is said that the sharing economy, among others, creates unjust competition, threatens existing tourism related jobs, decreases job security, evades taxes and causes revenue loss (Juul, 2015). Zervas, Proserpio, and Byers (2014) found that in Texas, U.S., Airbnb challenges the hotel sector. Nonetheless, the sharing economy in tourism is an evolution like many others. Just like YouTube disturbs the traditional TV, blogs threaten traditional media, the sharing economy "blows up the industrial model of companies owning and people consuming, and allows everyone to be both consumer and producer, along with the potential for cash that the latter provides" (Geron, 2013, p. 2).

# 2.3 Airbnb

Airbnb is a Tourism 2.0 sharing economy platform, as hosts offer their homes in the form of shared rooms, private rooms or entire apartments to guests on an online marketplace (Yannopoulou, Moufahim & Bian, 2013). It is a mostly user-generated (Yannopoulou, Moufahim & Bian, 2013) and peer-to-peer accommodation brand, where sellers provide their homes to consumers. It contains user generated content in the form of ratings (Zervas, Proserpio & Byers, 2015), allows users to create their own content in their listings and takes advantage of Web 2.0 to create trust (Guttentag, 2015). The business model of Airbnb is shown in figure 2, which depicts the company as a two-sided online marketplace. Owners publish their properties as Airbnb hosts, and visitors can rent these properties as Airbnb guests (Business Model Toolbox, n. d.). Extensive similarities between the shared economy model (figure 1) and the business model of Airbnb can be observed.



Figure 2. Airbnb's business Model, (Business Model Toolbox, n. d.).

### 2.4 Tourism Sustainability

Even though tourism is a means to achieve benefits, in most cases it also comes with undesired externalities (Choi & Sirakaya, 2006; Akis, Peristianis, & Warner, 1996). These side-effects have resulted in an increased need for a different approach on tourism development – sustainable tourism development (Choi & Sirakaya, 2006; Richards, & Hall,

2003). Sustainable development is important, because it ensures that current needs are met without limiting the needs of future generations (World Commission on Environment and Development, n. d.). The UNWTO (United Nations World Tourism Organization) defines sustainable tourism development as making optimal use of environmental resources, respecting host-communities, their heritage and their values, enhancing intercultural exchange, and lastly providing economic benefits to all stakeholders, including host communities (UNWTO, 2005). Sustainable development thus balances three sets of interests: the environmental, socio-cultural and economic.

It has been found that the sharing economy has impacts on sustainability (Juul, 2015; Botsman & Rogers, 2011). Many scholars found positive impacts (e.g. Hamari, Sjöklint & Ukkonen, 2015; Walsh, 2011). In the tourism sector, so far mostly social and economic aspects are taken into consideration (Botsman & Rogers, 2011).

One of the aims of the sharing economy is to bring economic benefits to owners of under-utilized resources. In 2013, the Forbes magazine estimated that the sharing economy would bring over \$3.5 billion directly into the providers' pockets (Geron, 2013). A study by Compete Inc. showed that user-generated content influences online travel bookings of around \$10 billion a year (Sarks 2007; cited in Schmallegger & Carson, 2008). Brian Chesky, the cofounder of Airbnb, said that the service providers on Airbnb are liberated and economically empowered (Geron, 2013). Moreover, a study by Airbnb compared traditional tourists with Airbnb travelers, and found that travelers stay longer and spend more in local communities, giving economic benefits to residents and local businesses (Airbnb, n. d. b).

The biggest advantage of the sharing economy is, however, presumed to be social as it allows one to make meaningful connections (Walsh, 2011). Botsman and Rogers (2011) say the implied collaborative consumption strengthens a sense of community. When people participate in the sharing economy, what they seek for is a direct interaction with the local community (Guttentag, 2015), or as Gebbia (2016), the co-founder of Airbnb, said, hosts and guests are seeking "the connection beyond the transaction" enabled by the sharing economy.

Even though little literature exists on the environmental impact of the sharing economy, researchers have found that frequently, participation in the sharing economy is motivated by

environmental awareness (Gansky, 2010), environmental concerns (Botsman and Rogers, 2011) and critical opinions of over-consumption (Belk, 2014). A report by the Cleantech Group (2014) for Airbnb found that users of Airbnb use less energy, less water and create less waste and CO2 emissions than regular hotel guests.

#### 2.5 Drivers to Reduce Environmental Impact in Tourism Organizations

Three drivers for environmental change in tourism organizations have been found: governmental policies (e.g. Buckley, 2012; Buckley, 2011; Font& Buckley, 2001), consumer behavior (e. g. Bader, 2005; Buckley, 2001) and management actions (e. g. Buckley, 2012; Bader, 2005).

Governmental policies are used as a tool to reduce the environmental impact caused by tourism. Strategies that are currently being used to change behavior are market-based (Buckley, 2012). For instance, local urban tourism laws incorporate environmental regulation such as minimum standards for water or energy appliances (Buckley, 2011). Other examples include the European Union which is a global leader in addressing environmental impact through policies (Kelemen, 2010) or the German government who has been supporting the introduction of ecolabels in the German tourism industry (Font & Buckley, 2001).

Regarding consumers, Bader (2005) found that there is an existing demand for hotels performing better in environmental matters exists. His study found that this demand is what drives hotels to act responsibly and sustainably towards the environment. Buckley (2001) found that ecolabels could become an environmental management tool of great value, as they are an element affecting consumer's choice. Even though providers are the ones making changes to reduce environmental impacts in form of for example ecolabels, in the end it is the consumer who takes those changes into account by choosing them or paying extra for them. Through this, the responsibility to reduce environmental impacts shifts from management to consumer (Buckley, 2001).

Another way to reduce negative environmental impacts is through management actions and technologies (Buckley, 2012). It is in the interest of tourism managers to improve their environmental performance, as a tourism organization can only survive through both economic and ecological presence (Erdogan & Tosun, 2009). Managers are also starting to see the importance of preserving the environment for their profit, as the environment is usually

what attracts tourists (Bader, 2005). However, despite the existence of technologies to reduce one's impact, there is a lack of adoption of these technologies (Buckley, 2011).

#### 2.6 Environmental Performance of Organizations

Many organizations have been turning to improving their environmental performance (Melnyk, Sroufe & Calantone, 2003) and often use Environmental Management Systems (EMS). EMS are part of the management system of an organization (ISO, 2016) and translate into environmental assessment criteria to assess processes within a business. Environmental management "includes the organizational structure, the responsibilities, policies, practices, procedures, processes and resources meant to achieve and maintain a specific environmental behavior", which in turn minimizes the environmental impact that the firm's operations cause (Erdogan & Tosun, 2009, p. 406). Generalized frameworks that are specified for particular businesses are employed to do this (El-Gayar & Fritz, 2006).

The most widely used standards on environmental concerns are the ISO 14000 series. Out of these standards, ISO 14001 concerns environmental management. It is an internationally recognized standard for EMS (Synergy Ltd, 2000) and provides a baseline for corporate environmental management (ISO 2016; El-Gayar & Fritz, 2006; Melnyk, Sroufe & Calantone, 2003). This EMS standard aids organizations to "[manage] their environmental impacts and [improve] environmental performance caused by their products, services and activities" ("What is an environmental management system?", n. d., p. 1). The ISO 14001 provides a system to track, manage and improve a company's performance regarding environmental matters. A main motivator for companies is the resulting cost-saving from energy, input, waste, lower environmental impacts and better image (Chattopadhyay, 2001). The ISO 14001 functions on the basis of four steps: Planning, Implementation, Checking, and Improvement (ISO, 2016).

Tourism organizations also turn to environmental standards and certifications, but usually to ones with softer systems than traditional EMSs such as the ISO (Synergy Ltd, 2000). Certifications, such as ecolabels, are often used to evaluate the environmental performance of tourism-related organizations or destinations. They allow businesses to show their environmental credentials (Synergy Ltd, 2000) and thereby influence the decision making of consumers (Buckley, 2001, Synergy Ltd, 2000). Usually, these certifications are based on standards or guidelines. One example of a certification is the Green Globe 21 certification for sustainable tourism, which uses the ISO 14001 and several other standards as a baseline (Synergy Ltd, 2000). The Green Globe assesses the performance of tourism related businesses and their supply chains through a structured method (Green Globe, 2017), attempting to use standardized rules to be able to compare between companies or destinations on a global level (Font & Buckley, 2001). Font and Buckley (2001) found certifications or labels differ in levels and sizes. An example of a supranational label is the Blue flag label in Europe. National label examples include the Nature and Ecotourism Accreditation Program in Australia, or 'green suitcase' in Germany. At the company level, a good example is given by TUI (Font & Buckley, 2001). Buckley (2001, p. 216) names TUI the "best international example of a single-company system" in regard to environmental certification. The company does not have an ecolabel, but TUI itself verifies and guarantees the environmental consciousness of the services and products it offers. TUI:

(i) encourages improved environmental management by hotels listed in their brochures;

(ii) includes environmental information on these hotels in TUI holiday brochures;

(iii) requires contract partners to complete a TUI environmental checklist; and

(iv) collects environmental information on these partners through guests as well as employees on site. (Buckley, 2001, p. 216)

# 3 Methodology

#### 3.1 Research Design

This research is an exploratory descriptive research, as it tries to answer the question of what is going on, rather than why it is going on and no comparable studies exist (De Vaus, 2001). A global, supply side approach is taken to study Airbnb. Mixed methods are used, collecting both qualitative and quantitative data (Johnson & Onwuegbuzie, 2004). Data is collected through gathering online textual contents from three different online sources and through questionnaires. For one of the three online sources, a single-case study of Airbnb in Amsterdam was taken.

#### 3.2 Operationalization

A theoretical framework to assess whether or how Airbnb or Airbnb hosts try to reduce the environmental impact of Airbnb properties was provided through the literature review. Airbnb was compared to organizations in the tourism industry, as no literature exists on environmental management of online sharing platforms, nor on Airbnb's environmental management. The drive to change current environmental management of tourist accommodation entities was traced to three sources: governmental policies, consumer actions or managerial steps. Furthermore, a variety of tools to measure environmental impacts were identified.

Concerning governmental policies, Airbnb as a global corporation adapts to local jurisdictions and laws. Airbnb guests are the consumers who cause the environmental footprint. Both Airbnb as the platform, and Airbnb hosts act as managers. This thesis focuses on the supply side of Airbnb, thus the measures taken by hosts and the platform itself were considered.

By considering the two managerial actors, there are three possible scenarios in regard to the reduction of the environmental impact on the platform of Airbnb. Either Airbnb sets environmental standards/incentives/suggestions to hosts, which in turn reduce the environmental impact; or, Airbnb hosts reduce the environmental impact of their properties without the influence of Airbnb; or third, neither Airbnb nor Airbnb hosts act upon the environmental impact caused. It is examined which of the three ways is closest to reality.

Inspiration for the structure as to what needs to be assessed within this research was taken from the performance-based environmental management assessment ISO 14001. ISO 14001 consists of four steps: Planning, Support and Operation, Evaluation, and Improvement. The case of planning suggests that Airbnb as the organization can be analyzed to see whether they have commitment or standards towards the environment. For the step of support and operation, the support or incentives to hosts by Airbnb can be analyzed, and it can be studied what hosts actually do to minimize the environmental impact of their properties. In the evaluation step of this ISO standard, the opinions of hosts towards the sufficiency and efficiency of standards can be looked at and incentives given by Airbnb to reduce this impact can be evaluated, the interest or disregard towards this issue can also be reviewed in this step. Lastly, assessing the step of improvement could show the unfulfilled potential of the Airbnb platform in terms of its influence on lowering environmental impacts of tourism.

To be able to analyze the environmental impacts caused by Airbnb properties, indicators were created. Indicators are useful for clarifying concepts and turning them into observable measurements (De Vaus, 2001). These indicators were looked for during content analysis, and were used to structure the questionnaire. They were created based on a search of existing studies using and exploring environmental indicators (e.g.; European Commission, 2015; Choi & Sirakaya, 2006; Miller, 2001), reports on environmental impacts in the tourism sector (Rahman, Reynolds & Svaren, 2012; Buckley, 2011; Buckley, 1996), reports on the building sector (Arena & de Rosa, 2003), the Green Globe standards and the previous results of an Airbnb study (Cleantech Group, 2014). Water, waste, energy and greenhouse gases have been selected as indicators.

#### 3.2.1 Water

Water-use has been assigned a critical area to address in the environmental performance of tourism organizations (Buckley, 2001) and conservation of water is needed in all tourism accommodations (Buckley, 1996) and even more in urban hotels (Buckley, 2011). A study of European hotels by Bohdanowicz and Martinac (2003; cited in Rahman, Reynolds & Svaren, 2012) also revealed water-use of guests as a key concern. Due to the increasing scarcity of

water, water consumption is one of Green Globe's assessment criteria for improvement regarding environmental performance (Green Globe, 2017).

#### 3.2.2 Waste

Another aspect for improvement in the criteria of Golden Globe is waste management and minimization (Buckley, 2001). The Green Globe standards suggest using the strategy of Reduce, Reuse and Recycle in tourism operations (Green Globe, 2017). Rahman, Reynolds & Svaren (2012) see waste as being at the core to reduce negative impacts on the environment.

#### 3.2.3 Energy

Green Globe, again, uses energy as a point of improvement in environmental performance (Buckley, 2001). Energy efficiency is becoming customary in tourism accommodations (International Hotels Environmental Initiative, 1993), and energy conservation is needed in urban hotels (Buckley, 2011). The Green Globe finds energy use to be one of the worst existing activities of tourism companies and efficiency would be crucial to decrease negative environmental impact (Green Globe, 2017). Arena & de Rosa (2003) found that between 28% to 45% of total energy consumption is created by the building sector. Residential buildings account for about two thirds of this energy use.

# 3.2.4 Greenhouse Gases

The last identified indicator is greenhouse gases. McKinsey & Company (2009) found the building sector to be a rigorous emitter of greenhouse gases. An example of how hotels create CO2 emissions is through heating, for instance of water or rooms, which yearly creates millions of tons of emissions (Rahman, Reynolds & Svaren, 2012). Most of the impact caused by greenhouse gases can be minimized by businesses directly (Green Globe, 2017).

### 3.3 Data Collection and Analysis

Online textual contents gathered from three various sources and questionnaires for hosts were collected. These were analyzed through content analysis and descriptive statistical analysis.

#### 3.3.1 Online Content

Online content was collected from three sources: Airbnb's official websites (airbnb.com & press.atairbnb.com), online peer-to-peer generated content of Airbnb (community.withairbnb.com & airhostsforum.com) and listings of Amsterdam properties on Airbnb. The content of Airbnb's website was collected to reveal information on standards and incentives imposed on hosts to reduce negative environmental impacts of their properties, the collection of user-generated content aimed to find out opinions and actions of hosts regarding the implementation of environmental measures onto their properties and the content of listings aimed to show whether listing descriptions mention any measures taken by hosts regarding environmental sustainability of their properties.

For most of the online content, data was collected globally rather than in a specific context of a case study. This is because Airbnb is a single organization operating on an international level, and global standards/incentives do not need context to be analyzed. Airbnb's standards are the same for all hosts, the only difference may be in the legal frame hosts must oblige based on their country. Furthermore, this global perspective could be taken, as a wide range of participants could be reached forming a representative sample.

However, data from the listings was collected only from Amsterdam, to be able to make more accurate conclusions. This is due to my limited time to research a representative sample size of all of Airbnb. Therefore, a case study was opted for, which would provide me with listings from a similar environment and context. Amsterdam was chosen as a case, because the city is known as being innovative and adaptive to new practices. The city agreed on a legal agreement with Airbnb (I amsterdam, 2014), settling rules and regulations for Airbnb and its hosts (DutchNews, 2016) and is currently one of the leading partners of Airbnb (Punyte, 2016). There are existing controversies about Airbnb in Amsterdam: The Guardian (2016) says that Airbnb adds to the already existing issue of overcrowding in Amsterdam and to other negative social impacts on locals (Zee, 2016) as for example the rise of real estate prices (ING, 2016); Other sources show the positive impacts on Amsterdam and its inhabitants (Airbnbcitizen, 2016; I amsterdam, 2014; Airbnb, n. d. b); Airbnb's claims it intends to reduce the overcrowding in the center by moving visitors to other neighborhoods (Airbnb, 2016b); Furthermore, there have already been several studies in Amsterdam, however, the

environmental influence of Airbnb on Amsterdam has not been evaluated yet;. Lastly, data on Amsterdam's Airbnb listings is available online and can be accessed and used freely.

The entire official website of Airbnb was searched through to find out about standards and incentives to hosts, which resulted in the collection of textual content from 11 relevant web pages. Two user-generated websites were searched through to find relevant data on this topic, which resulted in the collection of 27 user-generated entries. To collect data for the content analysis of listings, a representative sample of hosts was selected. A proportionate number of listings for private rooms, shared rooms or entire apartments was considered for the sample. Out of the total 15,081 homes offered on Airbnb in Amsterdam in 2017, 78.1% are entire homes or apartments, 21.5% are private rooms and 0.4% are shared rooms. The consequent sample of listing was 78 entire homes, 21 private rooms and three shared rooms. Three listings were selected for shared rooms, since it is not possible to analyze 0.4 of a listing and neither is it representative. This means, that in total 102 listings were collected for the analysis.

In total, this resulted in a body of approximately 61,900 words. 9,500 words were collected about Airbnb's standards, 14,000 words of user-generated content and 38,400 words from Amsterdam listings.

Once the data was collected, it was analyzed with content analysis. Content analysis is a widely-used analysis technique in the social sciences, entailing a systematic review of texts, images or symbols. It allows researchers to make valid findings from texts or other materials (Krippendorff, 2004). Bodies of text were analyzed to find themes within the texts (Hsieh & Shannon, 2005), which is often referred to as coding (Corbin & Strauss, 2008). To analyze texts, first, a pilot analysis of 10 listings and 3 blogs was done. This was useful to test the valuableness of my method (Maxwell, 2008) and to gather insights for the final study (e.g. Qu & Dumay, 2011; Vanderwee et al, 2007). A pilot analysis for the content of Airbnb's website was unnecessary, as its analysis aimed to reveal existing standards and incentives. Both pilot analyses showed that the four indicators for environmental sustainability in households found for the operationalization were also mentioned in these texts. In addition to these indicators (water, waste, energy, CO2), the pilot analysis of user-generated contents revealed three additional themes: other environmentally related measures, measures taken

for economic purposes and suggestions for standards. The pilot analysis of listings showed two additional themes: other environmentally related aspects, and potential to mention environmentally related aspects in listings.

After the pilot analysis, I conducted a content analysis of all the online textual data that was collected, coding them into themes found in the pilot analysis.

#### 3.3.2 Questionnaire

The data from the questionnaire was collected globally. A questionnaire was distributed to hosts to find out more about the steps they take to reduce the environmental impact caused by renting out their properties through Airbnb. The information gathered through questionnaires verified the content analysis results of Airbnb's website regarding standards and incentives to reduce the environmental impact of Airbnb properties, provided additional information on the measures taken by hosts to reduce the environmental impact of their properties, and showed opinions of hosts regarding the sufficiency of environmental standards set by Airbnb.

As the aim of contacting hosts through listings is for purposes of booking, and contacting them for other purposes may result in a ban from the Airbnb platform, hosts were not contacted directly through the Airbnb website. Instead, the questionnaire was posted on fora for Airbnb hosts. This, however, limited the number of hosts that I could reach. Hosts were contacted through Reddit (SampleSize and Airbnb sub-Reddit), Facebook groups (Airbnb Greece- Greek Hosts, Airbnb Hosts Amsterdam, Airbnb Hosts France, Airbnb Hosts in Japan 日本のエアビー アンドビーホスト, Airbnb Hosts in Vietnam, Airbnb Hosts India, Airbnb Hosts Worldwide, Norway in Hardanger, Prague AirBnB hosts), two forum websites (Airhostsforum.com & Community.withairbnb.com) and through personal communication. Afterwards, snowball sampling was used, as participants were asked to forward the survey to other hosts they knew.

The questionnaire follows a structure from general to specific and contains 19 questions. The intention was to create a short questionnaire in order to increase the likelihood of hosts responding. First, participants were asked about general information on Airbnb standards, then about environmental standards and incentives given by Airbnb and lastly, they were

asked about the specific steps they take in their properties (see appendix 1 for entire questionnaire).

The part in the questionnaire regarding specific steps taken in one's property was structured based on environmental indicators found during operationalization. For the purpose of this questionnaire, for each of the four indicators, a set of sub-indicators was composed after a desk research of how homes can reduce their environmental impact. These sub-indicators are based on the WWF and the UN Sustainable Development Goals suggestions on how households can lower their environmental impacts (WWF, n. d.; United Nations, n. d.) and my own ideas. The indicators and their 17 sub-indicators used in the questionnaire can be seen in table 1.

Types of questions used were single-answer questions, multiple choice questions, questions with a Likert scale and two open questions. Respondents always had a possibility to leave more comments. Furthermore, the platforms through which the survey was spread usually had a possibility of leaving comments below my post, which were also used in the analysis.

Energy efficiency		
Smart Meter		
LED lightbulbs (or other energy saving lightbulbs)		
Energy efficient appliances		
Water use		
Smart Meter		
High-efficiency shower(head)		
3L flush/electric toilet		
Re-use of water		
Collection of rainwater for own use		
Waste reduction		
Encouragement of guests to separate waste		
Compost pit in garden		
Provision of reusable shopping bags for guests		
CO2 emissions		
Energy-efficient appliances		
Renewable energy (solar, wind, etc.)		
Information on public transport/car-sharing rather than renting a car		
Provision of bikes		
Vegetarian recipes		
Option to plant a tree		

Table 1. Indicators and sub-indicators for questionnaire.

A total of 50 questionnaire responses was collected and analyzed. In addition to the collected data from the questionnaire, often people unwilling to participate in the questionnaire left comments regarding their opinions on reducing the environmental footprint of their guests in their properties. As there are two open questions in the end of the survey: "Do you take any other measures to lower your guests' impact on the environment?" and "Do you have any other comments regarding the environmental impact of your guests?", the comments left under my posts were used and analyzed as answers to these two questions. This created nine additional comments for the first question and seven additional comments for the second question.

Responses were analyzed quantitatively with descriptive statistics on the environmental indicators selected beforehand. The data was analyzed through SPSS and descriptive summaries are given for the answers to all questions. Each of the indicators has been summarized in a table with the correspondent data. Cross-tabulation has been used to see the relationship between the different responses of two questions.

Respondents came from 16 different countries: 14 from the Netherlands (28%), 13 from the United States (26%), 5 from Slovakia (10%), 4 from Greece (8%), 3 from the United Kingdom (6%), and one response each from Vietnam (2%), Canada (2%), Czech Republic (2%), France (2%), Germany (2%), India (2%), New Zealand (2%), Norway (2%), Slovenia (2%), Spain (2%), and Thailand (2%). One respondent joined Airbnb in 2008, five in 2011, three in 2012, six in 2013, four in 2014, 10 in 2015, 15 in 2016 and six in 2017. 58% of the listings were entire homes, while 42% were private rooms.

# 4 Results

The following section provides results to the three specific research questions regarding the environmental measures taken by Airbnb hosts in their properties, the role of Airbnb in these measures and the unfulfilled potential of Airbnb and its hosts to reduce environmental impacts of Airbnb. For each of these sections, the collected data from the questionnaire and/or online content was used. Sources of the online content from Airbnb's website and the user-generated web pages are mentioned in brackets behind the text and can be found in appendix 2 and 3.

# 4.1 Environmental Measures Taken by Airbnb Hosts

To find out about the steps taken by Airbnb host in regard to the environmental impact caused by renting out their properties, user-generated posts, listings and questionnaires were analyzed.

Questionnaires were structured according to the indicators identified in the operationalization section of this report and thus included data on all four indicators. Throughout the content analysis of user-generated posts and Airbnb listings these indicators re-appeared. In addition to the indicators, both listings and user-generated data showed a theme of other environmentally related measures/aspects by hosts. Other environmentally related measures of the questionnaire. Furthermore, user-generated posts showed that many of the environmentally sustainable measures taken on by hosts are led by economic incentives. For this reason, the results of environmental measures taken by Airbnb hosts are structured according to indicators, followed by other environmentally related measures taken by hosts and environmentally sustainable measures led by economic incentives.

### 4.1.1 Water

Water was discussed in four of the 27 user-generated posts, in terms of the need to care, ways to encourage guests to limit their water use, and ways to ensure conserving water. Posts were related to the current droughts in California (USA) and Virginia (USA), where hosts raised the need to care for the environment more than before [2]. Ways to encourage guests to conserve water were suggested in terms of encouraging handwashing dishes in sinks without running

water, shorter showers [25], turning off water when possible and toilet flushing [18]. Hosts contemplated, that conserving water can be done primarily by changing the behavior of guests. Raising awareness of this issue by hosts is done through personal communication, prior message notices and signs [18] or house rules [25], however these have not been proven effective. This is why other hosts have suggested to take measures into their own hands. Tips included installing aerators on taps, dish pans, low-flow toilets, water conserving shower heads, providing glasses for tooth-brushing, or asking guests to set used towels apart from unused ones [15].

In the listings analyzed, many mention water use in their descriptions. However, most of the time, water is not mentioned in terms of environmental awareness, but rather as amenities that homes entail.

For listings of entire homes/apartments, water use is mentioned mostly in terms of having a bathroom and sometimes specifying the bathroom to having a shower, a bathtub, one or multiple sinks, a toilet, Jacuzzi, or sometimes these are described with adjectives such as a walk-in/rain shower, renovated/modern/large/basic bathroom. Some hosts also allow guests to use their washing machine, dryer, dish washer, or similar household appliances. Similar to entire homes and apartments listings, most private room listings also mention the bathroom and some of its features, but not into more detail than mentioning a shower/bathtub/sink. The listing description of shared rooms are in general shorter and one of the three analyzed mention the bathroom only in general terms.

One of all the listings mentioned reducing water use by using solar power in order to conserve water due to environmental reasons.

Out of the 50 hosts that participated in the questionnaire, 22 (44%) said to take measures to lower the water use of their guests. Specific measures taken by hosts are shown in table 4. Even though 22 (44%) take some measures to reduce the water footprint of their property, only 6 (12%) mention this in their listings. For each of the four indicators, hosts were asked whether the measures they have implemented to reduce the environmental impact of their guests were taken voluntarily, or because of incentives/standards from Airbnb. For Energy, Waste and CO2 emissions, 100% of those who said to have taken measures took them voluntarily. For water, however, 95.8% said to have taken these measures voluntarily. One of

these respondents said measures were taken because of Airbnb's requirements, but did not specify this.

One respondent that has not taken any measures regarding the water use of their guests, has not done this because "water is not restricted in my area", and another mentioned thinking about changing the shower head after upgrading the bathroom.

Tuble +. Measures taken by nosis to lower the water use of guests.
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Measures to lower the water use of guests	Responses	Percentage
None	28	57%
High efficiency shower(head)	16	32%
3L flow/electric/efficient toilet	11	22%
Collect rainwater	1	2%
Individual responses:		
<ul> <li>Remotely control heating and air-conditioning</li> </ul>	1	2%

In the open questions of the questionnaire, hosts said that in addition to the categories mentioned in the questionnaire, in terms of water, they use aerated bathroom facilities (sink, shower, toilet), ask guests to re-use towels or have decided to remove lawn from their property, to reduce water and energy needs.

These results show, that hosts take measures to reduce the environmental footprint left by the use of their properties. Hosts recommend doing this by upgrading the features of their properties, as changing behavior of guests has been proven ineffective. The analysis of listings showed that out of the 102 listings, only one mentioned water use reduction in a direct way. This means, that even if steps are taken, they are mostly not mentioned in the listings. This was also confirmed with the questionnaires, as only around one fourth of the hosts that take measures to reduce their water footprint mention this in their listing description.

# 4.1.2 Waste

Waste was discussed in 10 user-generated posts. Many hosts mention trying to minimize the waste footprint of guests through separating recyclable trash and composting [2, 9, 11, 15]. Encouraging guests to do so responsibly [11] can, for example, be done through labelling bins according to categories [15, 25]. However, many hosts found it difficult to engage guests in this, saying "I can't even imagine ask[ing] my guest to follow this, many of them can't even

turn the AC o[ff] when they go out" [15]. Nevertheless, some hosts put waste handling in their house rules [26]. Another way to reduce waste was, again, by taking measures into own hands. A host providing breakfast suggests being ahead of your food and using it to one's own advantage. Freckled fruits and almost expired products can be used for baking, uglier fruits can be frozen and used for smoothies. Other vegetables can be used as compost. The host recommends others to "Repurpose, recycle, reuse" [16]. Multiple hosts discussed the waste of packaged toiletries [19,21]. Instead of throwing away bars of soaps only used a few times, liquid soaps can be provided to guests [19, 21] or dispensers for the shower can be used to reduce wastage and expenses [21]. Another host suggested a producer that provides small packages, however, the packaging is recyclable and the soap vegetable based [21].

In terms of listing descriptions, waste is often addressed indirectly, and mentioned directly on a very limited basis. Only four entire home/apartment listings mention waste directly. Only one in terms of environmental sustainability. This listing mentions that there is no need to purchase bottled water as tap water in Amsterdam is of high quality. The three other listings ask guests to make sure trash is in the bins, bagged or put out on the street/in an outside container.

Indirectly, waste is reduced through hosts providing a kitchen to their guests. Almost all listings include their kitchen in the list of their amenities, meaning that guests can use them. 31 out of the 78 hosts specifically said in their listing description that their guests are allowed to use their fully-equipped kitchen. These hosts mentioned that guests to use them either in terms of appliances and kitchenware, or including tea and coffee, cooking essentials, and for some even including the food that can be found in the kitchen. This means guests do not have to buy non-reusable items to use. Furthermore, some hosts mention that guests can use other items, as their shower gel, shampoo, or everything that can be found in the bathroom. 75 hosts out of 78 mention essentials as shower gel and shampoo in their provided amenities list. This also means that guests do not have to buy one-time items for their trips.

The same applies to private rooms and shared rooms. Waste is mentioned rather indirectly, with only one listing mentioning throwing out trash specifically. Indirectly, however, many reduce the waste of guests. This is again done through providing items that would otherwise have to be bought by guests and would create waste. This includes providing guests with reusable kitchenware, kitchen equipment, bathroom necessities and basic food and drinks

such as coffee, tea or oil. Four out of the 21 private rooms do not provide guests with their kitchen, while all except one listing provide guests with essentials. Two out of the three shared rooms listings provide guests with both the kitchen and essentials for guests to use.

Regarding the 50 questionnaire participants, 35 (70%) take measures to influence the waste of guests. Specific measures taken by hosts are shown in table 5. Less than one fourth of these hosts include this in their listing description.

Measures to lower waste produced by guests	Responses	Percentage
Encourage separating waste	32	64%
None	15	30%
Provide reusable bags	13	26%
Compost pit	7	14%
Individual responses:		
<ul> <li>Host separates waste after guests leave</li> </ul>	1	2%
<ul> <li>Purchase large packages of soap and shampoo</li> </ul>	1	2%
<ul> <li>Provide basic foods</li> </ul>	1	2%

Table 5. Measures taken by hosts to lower waste produced by guests.

In the open questions of the questionnaire, hosts said that in addition to the categories mentioned in the questionnaire, in terms of waste, they:

- educate guests on waste sorting, label bins to recycle and compost, separate glass and plastic,
- provide guests with reusable glass bottles, refillable containers and a water filter pitchers,
- grow own vegetables for guests to eat,
- do not provide plastic coffee pods or single-pod coffee machines,
- provide towels instead of paper towels,
- provide reusable items (glasses, plates),
- do not provide bin liners to reduce use of plastic bags, and
- encourage guests to cook at home rather than take-out food in plastic containers.

All in all, hosts take steps to reduce waste of guests, both knowingly and unknowingly as well as directly and indirectly.

#### 4.1.3 Energy

Energy use was discussed in twelve user-generated posts. Hosts often ask guests to be cautious with their energy use. Some hosts include energy (in terms of switching off lights, air-conditioning or use of washing machine in off peak hours) in their house rules [5,7]: "Please help conserve power by . . . turning off lights and air-conditioners while not in the room" [25], however, this is often found to be ineffective [5]. Putting up notes [5, 7] to remind guests or personal communication before [5] or after booking approval [7] about green standards was said to work better. Many hosts had become aware of the facts that guests leave energy-reliant appliances turned on during their absence [5, 7], wasting energy, with air conditioning being the most observable waste [7]. Some hosts decided to penalize guests with extensive use of energy by deducting costs from the deposit [7].

Instead of relying on the behavior of guests, own measures to reduce energy use of a property are taken by many hosts. One host offered his expertise in solar energy to guide interested hosts with its implementation in their properties [2]. Other measures taken to reduce energy use by guests are mentioned in table 2. Some of these measures were, however, commented to be expensive interventions [5]. The comments also showed some opposing views as the following one: "Of course conserving energy is better for us all. However, what I am going to say will be upsetting, I know. Your guests are exactly that - your guests. A host ought to be honoured that they have chosen to stay in their Airbnb in a highly competitive market" [7].

In the listing descriptions, again, energy use is mentioned rather indirectly than directly. Out of the 78 entire homes listings, only one listing addresses energy directly. This listing specifically mentions caring for the environment and for these reasons using solar power as a main source of energy. Indirectly, however, energy use was found in many listings. In terms of kitchen equipment, other appliances, heating, water heating, lighting in the home, etc. Moreover, energy can indirectly also be found in the list of amenities that are provided by the listings, in terms of ticking off for example a television, heating, air-conditioning, washer or the dryer.

The same has been found for the private rooms listings and shared rooms listings. One of the shared rooms listings mentioned reduction of energy use directly – asking guests to turn down heating when not being in the apartment.

Table 2. Other measures taken by hosts to reduce energy use.

- Energy efficient appliances,
- energy efficient water dispenser [23],
- low energy taps to reduce the energy needed to use for heating water [2],
- LED lights which consume very little energy [2, 5], replacing switches with automatic timed switches [5] or motion sensors [7], timers [7, 24], remotes, apps, energy-saving lightbulbs, or solar charging light-bulbs [7]. Phillips hue smart bulbs were also recommended, as they can be dimmed or turned off remotely or installed for a timer to turn off automatically [5],
- replacing air-conditioning with an evaporative cooler or ceiling fans [7] or inverter air conditioner [22],
- a NEST thermostat to control lights [5, 7], heating and cooling; a NEST thermostat also allows hosts to lock the temperature between a range [5],
- thermodynamic solar panels [2],
- generating own electricity [9], being off-grid [12],
- air-drying laundry [2, 15],
- curtains [7].

44 (88%) of the 50 questionnaire respondents take measures to reduce the energy use of their guests. Specific measures taken by hosts are shown in table 3. The next question asked hosts to tick their energy efficient appliances, to which 42 hosts responded, raising the percentage of hosts providing energy efficient appliances from 33 (66%) to 42 (84%). Even though 84% of the respondents take measures to reduce the energy footprint of their property, only one sixth of these indicate this in their listings.

In the open questions of the questionnaire, hosts said that in addition to the categories mentioned in the questionnaire, in terms of energy, they ask guests to close windows and doors if heating/cooling is turned on, produce solar energy, put locks over thermostats, and use windows and fans instead of air-conditioning.

Energy use is the indicator which received highest score among the four in the questionnaires. User-generated data confirmed, that this is an issue many hosts take into account. However, again only in one listing, reduction of energy is described directly.

Measures to lower energy consumption of guests	Responses	%
LED/energy saving lightbulbs	38	76%
Energy-efficient appliances	33	66%
Smart Meter	8	16%
None	6	12%
Solar water heater	2	4%
Control of heating by host	2	4%
Automatic lights	2	4%
Low flow/flush toilets	2	4%
Low flow shower heads	2	4%
Individual responses:		
<ul> <li>Notes/personal communication about energy-savings</li> </ul>	2	4%
- Recycling	2	4%
- Winterize windows	1	2%
<ul> <li>Off peak hours use of washing machine</li> </ul>	1	2%
<ul> <li>Public transportation information</li> </ul>	1	2%
<ul> <li>On demand water heater</li> </ul>	1	2%
<ul> <li>Do what makes sense in economic terms</li> </ul>	1	2%
- Solar panels	1	2%
<ul> <li>Ask to lower heating when absent</li> </ul>	1	2%
<ul> <li>Electricity from waterfall</li> </ul>	1	2%
- Wi-Fi thermostat	1	2%

Table 3. Measures taken by hosts to reduce energy use of guests.

# 4.1.4 CO2 Emissions

Out of the 27 user-generated posts, two posts shortly addressed the carbon footprint of properties. One self-reflected on the low efficiency of his property [5], another was on the opposite of the spectrum, mentioning the sustainability of his property and trying to constantly lower his carbon emissions knowing many hosts similar to him [9].

Again, in listings, CO2 emissions are mentioned rather indirectly. None of the entire home listings mention their carbon footprints directly.

Indirectly CO2 emissions can be found in listing descriptions in form of mentioning transportation. All except for five entire home/apartment listings mention transportation in some way. Most out of these provide information on reaching the property by public transportation, some hosts provide bikes or suggest bike rentals, and only a few mention Uber, taxis or private cars. Many hosts suggest discovering Amsterdam by foot. 17 out of the 21 private rooms listings mention public transport, eight mention exploring Amsterdam by foot or bike, and 3 mention private transportation like a car or taxi. All three of the shared

rooms mention public transportation and one offers a bike and suggests walking to the tourist attractions.

Out of the 50 questionnaire respondents, 41 (82%) of hosts said they take measures to lower the carbon footprint of guests. Specific measures taken by hosts are shown in table 6. Again, only a small proportion of the 41 hosts, 3 (7,3%), mention these measures in their listing descriptions.

Measures to lower the carbon footprint of guests	Responses	Percentage
Public transport/car-sharing information rather than other		
transport means	30	60%
Energy-efficient appliances	29	58%
Bikes	10	20%
Purchasing of renewable energy	10	20%
None	9	18%
Vegetarian recipes	1	2%
Individual responses:		
<ul> <li>Produce renewable energy</li> </ul>	2	4%

Table 6. Measures taken by hosts to lower the carbon footprint of guests.

In the open questions of the questionnaire, hosts said that in addition to the categories mentioned in the questionnaire, in terms of the carbon footprint they purchase green gas or provide walking maps.

Few user-generated posts regarded ways how hosts reduce the carbon footprint caused by their properties or their guests. The only and indirect way hosts mentioned this indicator in their listing descriptions was through transportation. Transportation measures were proved to be the main measure taken by hosts in questionnaires as well (see table 6).

# 4.1.5 Other Environmentally Related Aspects

Listings and user-generated data revealed other environmentally related measures/aspects carried out by hosts to reduce the environmental footprint of their property caused by renting it out on Airbnb. Questionnaire respondents also mentioned other environmentally related measures in open questions of the questionnaire.

Many hosts active on the two user-generated websites showed concern about the environment. One of the hosts posted, that while having encounters with other Airbnb hosts and guests, he found that many members of the community that he had met realized the need to care about the environment [2]. Beliefs that sustainability is needed dominate these views, and initiatives to preserve and protect the environment [6] should come from the Airbnb community [2]. Some hosts are motivated by personal reasons, such as chemical sensitivities [6, 9]. Pity was shown towards people uneducated in the area of chemicals and environmental impact [6] and hosts urged each other to encourage other hosts and guests to be greener [15]. A number of hosts offer their knowledge on environmental subjects, such as solar energy [2, 12], ethical consumerism [4] or green living [12].

In addition to the identified indicators, hosts try to be environmentally friendly in factors such as eco-friendly paint [2], marmoleum floors [2], unbleached products [2], micro-fiber cleaning products [9], eco-friendly cleaning products [9], natural materials and products [2], growing own fruits [9], supporting nature by encouraging biodiversity in terms of planting flora, pest control [9], educating guests on green living [12], and promoting local products, businesses and experiences [13].

Hosts recommended to other hosts to mention the green aspects of their listings in the listing descriptions, as "green guests are interested in staying in places which have a green lean" [7]. As friendly house rules tend to be ineffective, straight forward do's and don'ts [7] are recommended, or signs and notes [8] are used more. Nonetheless, many said that they mention environmental consciousness in their house rules [25]. Furthermore, it was discussed, that practicing environmental consciousness depends greatly on the host and guest. "Everybody knows that Germans tend to be very eco-conscious" [26], some were referred to as being too "young to understand the consequences" [27] or that "some cultures have lesser awareness" [24].

Multiple hosts in the listings that were analyzed mentioned that while renting out their apartment/home, they are on vacation themselves, thus not using the space and providing it for use to others. Other hosts provide guests with tips and suggestions on what to do in the close surroundings, such as visiting local breweries, local shops and boutiques, local bars, restaurants and bakeries, markets, fresh local vegetables, botanical gardens, flea markets. By doing this, they want to give guests local tips about the neighborhoods, local food stores, local

knowledge, showing "hidden treasures" and local products. One of the listings suggested to visit the sustainable urban development front runner place De Ceuvel. Among other, many hosts mentioned the ambiance of the listings as in green or open-air areas, or in natural preservation areas. Many of the listings are located in neighborhoods close to the Amsterdam Centre, described by the quote: "Staying here gives you the possibility to explore this new and less touristic side of Amsterdam". One of the 78 entire home/apartment listings mentioned their furniture was recycled from their old furniture: "a very comfortable 4-poster bed which was made from old wooden floor boards from our house".

In addition to these, for private and shared rooms, an environmental advantage is sharing a space rather than just using one for oneself. Private room listings mention sharing the apartment with other housemates or renting out a room when one of the housemates is gone. Others offer tips on what to visit, local bars or coffee-shops, or the alternative side of Amsterdam. Some listings mention having a garden or being in close proximity to parks, nature, to lakes, birds and sunshine. One is close to a national reservation park and multiple are just outside the city center. One private room mentioned being an eco-house, having "clay walls, bamboo floor, new kitchen, bathtub with skylight and abundance of plants & good vibes .... The walls in our house are covered with 100% natural organic clay, to insulate sound and heat. This also protects against radiation and keeps the humidity levels balanced."

Shared listings also mentioned a nice environment near parks and nature and suggestions for local tips and things to do were also offered. One of the shared rooms listings mentioned being vegan and offered to cook vegan dishes for their guests.

To the question "Do you take any other measures to lower your guests' impact on the environment?" of the questionnaire, some respondents replied "no", saying that neither the host nor Airbnb should be reliable for this. Furthermore, one host does not want to "take on the liability of offering bicycles to my guests. If they want to injure themselves, let them go rent a bike from a bike shop and crash into a tree or parked car and put themselves in the hospital." Also, it was stated that one "can guide but not force behaviour", as guests pay for the use of facilities. "Airbnb has no business telling me or guests to be environmentally friendly".

### 4.1.6 Measures Led by Economic Incentives

Furthermore, user-generated posts showed, that many of the environmentally sustainable measures taken on by hosts are led rather by economic than environmental incentives. Seven posts mention their motivation being economic. Motivation to use the "refuse, reduce, reuse and recycle" model does not only have to be to help the environment, as it in the end helps save money as well [2]. Quite expensive interventions, such as installing the NEST smart meter, were contemplated as being cost-effective in the long run [5].

Many hosts have responded to posts about guests not turning off energy-using appliances as wasting money [5]. Many have turned to energy-savings after receiving high bills [5, 24]. Some include extensive energy use in their house rules to be able to deduct fees from deposits, one host suggested installing a coin meter if the cost of energy gets too high [7]. A more drastic measure suggested was covering thermostats, as they "come with a lock and keys that will help with the ac [and] you can get a remote to control the[ir] lights" [7]. Other suggestions included calculations of maximum energy costs and increase one's price by that amount to have the energy costs covered [7]. One host took extensive measures to reduce the cost of energy: "I am now embarking on a serious energy drive! We have installed solar power which goes some of the way! I am in the process of installing 1.5Kw Italian PRAVAC wind turbine, 2 inverters and an 850amp/hr battery storage array. I have installed 2 inverters, one for the solar and one for the wind because I envisage that most of my solar power which I receive a 50c per Kw 'feed-in' tarrif on will be exported back to the grid so I can actually get money for it instead of paying exhorbitant money for it" [17]. Hosts complained that guests forget that an electrical bill still has to be paid [7] and that guests think once they have paid for the accommodation, other expenses are not their concern [1].

Not only energy reaches to the pockets of hosts. Many mention toiletries and other one-time use products as being costly. "I don't even think my objection has anything to do with the environment. This is a very expensive way to provide your guests with toiletries!" suggesting buying big-sized toiletries instead [21].

All in all, hosts take measures to reduce the environmental footprint of their properties, however, most of these are not visible in their listing description. Many guests reduce the

environmental footprint of their property through energy, water, waste and CO2 measures. In addition to these, other measures have been identified. In user-generated data, interest and initiatives were found to increase environmental sustainability of properties. Furthermore, it was found that many hosts are incentivized to take these measures for economic purposes.

# 4.2 Airbnb Standards and Incentives

To analyze the role of Airbnb in the implementation of environmentally sustainable measures into properties rented out through this platform, Airbnb's existing standards and incentives were analyzed. The results have been found through the analysis of Airbnb's website and questionnaires.

A thorough search of Airbnb's websites (airbnb.com and press.atairbnb.com) showed 11 web pages related to their official and voluntary standards and rules. Two of these were related to the environment. These standards and rules play a role on the behavior of Airbnb guests. The content of these websites was divided into the following themes: how Airbnb forms standards, what formal standards and rules currently exist, existing voluntary standards, how standards are being enforced and Airbnb's support and suggestions to comply with existing standards.

Airbnb's website revealed that standards are constantly adapted and formed along the way, learning what is best from the community [1]. For this reason, hosts are asked to review existing standards regularly [7]. The reason to create and adapt standards and rules is to "ensure that guests and hosts feel welcome and respected in all of their interactions using the Airbnb platform" [9].

There are five existing formal standards and rules for the community of Airbnb, seven hospitality standards for hosts, and two formal non-discrimination policies. The five community standards (for both guests and hosts) are: Safety, Security, Fairness, Authenticity, and Reliability. Hosts have to comply with hospitality standards, which are: Availability, Communication, Commitment, Check-in, Accuracy, Cleanliness and Overall Experience. In addition to these standards, professional hospitality managers are also welcome on the Airbnb platform with some additional standards. The two non-discrimination policies are Inclusion and Respect. More detail on these standards and policies can be found in appendix 4. Compliance with standards earns hosts good reviews [4].

In addition to the formal standards, voluntary standards that hosts can comply with exist. These are evaluations of hosts that can increase for example the position of one's listing in a property search, or influence the decision of a guest when booking. The two existing voluntary standards are the Response rate of a host and a Superhost status [5]. A host has a high response rate when he/she responds to reservations and inquiries frequently and quickly. A high response rate impacts one's position in the search results. Being a Superhost results in a badge on one's profile and listings. This badge results in priority support, a Superhost search filter, travel coupons and product exclusives.

Standards are being enforced in two ways, through ratings and penalties. Guests can rate hosts in terms of the hospitality standards. The average of these ratings will appear on the listing [1, 5]. In case ratings are low, or if the platform has any other concerns, hosts are asked to adapt their listing description or behavior. The case of disobeying, constant low rates or inappropriate behavior can result in penalties such as deactivation of one's listing for a period of time, influencing one's search position, financial penalties and/or to a suspension/removal from the platform [2, 6]. In addition to non-compliance with hosting standards, a listing may be temporarily deactivated if a host declines a large number of guests [2]. If jurisdictions differ from the standards that are given by Airbnb, Airbnb does not require hosts to violate these laws, but provides additional guidance and adapts it policy to reflect local requirements [9].

Airbnb provides support and suggestions to help hosts comply with their standards. This is done through tips and tricks sections on various web pages. These tips and tricks include for example: ways to update one's calendar, tips for messaging, house rules, listing descriptions, using the Airbnb app, etc. Recently, Airbnb started a Mentor program, where experienced hosts help novice hosts [3]. Also, Airbnb offers hosts financial support in case of damages caused by guests, through the Airbnb Host Guarantee, protecting hosts up to 1.000.000\$ above the security deposit [8]. Lastly, Airbnb also promotes and supports sustainable travelling. Airbnb supports the initiatives of the UNWTO by partnering with the organization in their campaign International Year of Sustainable Tourism for Development. A partnership with the UN Environment program has been extended regarding education of travelers and hosts on sustainable traveling. Support from Airbnb that affects hosts more directly is its partnership with Vivint Smart Home to support more sustainable properties. This partnership gives hosts from the USA and Canada access to their energy-conserving thermostat management system [11].

The findings of the content analysis were confirmed with findings from the questionnaire. Standards are enforced through trust and reviews, as more than half of the respondents (60%) said Airbnb does not check the implementation of their standards. Six (12%) of the respondents said their listings have been checked after their listing has been approved to be put on the platform and five (10%) said the implementation of standards has been checked before their listing has been put on the platform. Nine (18%) responded with the option "other", five of these answers said that the implementation of standards is evaluated by the reviews of guests, one said Superhosts are evaluated every three months, and another stated that his listing was reviewed by Airbnb after it got a low (3-star) review by a guest.

The findings from the online contents were further confirmed by the responses regarding environmental standards, where 35 (70%) responded Airbnb does not set any environmental standards. When asked about what environmental standards Airbnb sets, three respondents answered energy use, three ticked CO2 emissions, two answered water use and two said waste handling. Out of the respondents that said that Airbnb sets standards to a "high extent", two said they do so in terms of "waste", two in terms of "energy use", one mentioned CO2 emissions and one said water use. One responded "common sense".

All things considered, these results showed Airbnb's existing standards and incentives. It has been revealed, that Airbnb does not set any environmental standards at the moment, but has shown two initiatives to partner with two organizations to promote sustainable travels and sustainable properties in North America. The role of Airbnb in the implementation of environmentally friendly measures into hosts' properties has thus been found to be limited. However, when asked whether or not Airbnb should do more to reduce the negative environmental impact of its users, less than half of the respondents said they believe Airbnb should do more about its potential to reduce the negative impact of its users. Yet 78% of hosts said they would still be interested in hosting on Airbnb if they set stronger environmental standards. The answer to these two questions, and the relationship between them can be seen in the cross-tabulation in table 7.

*Table 7.* Cross-tabulation between survey questions "Would you still be interested to host on Airbnb if it set stronger environmental standards?" and "Do you think Airbnb should do more about its potential to reduce the negative environmental impact of it guests?".

		Do you thi should do ma potential to negative env impact of	ink Airbnb ore about its reduce the vironmental it guests?	
		No	Yes	Total
Would you still be	Not at all interested	7	0	7
interested to host on	Not very interested	4	0	4
Airbnb if it set stronger	Neutral	13	5	18
environmental	Interested	3	4	7
standards?	Very interested	3	11	14
	Total	30	20	50

# 4.3 Potential to Reduce Environmental Impact of Airbnb

The next section provides an answer as to where Airbnb as the platform, and Airbnb hosts can implement more environmentally sustainable measures. These findings come from all four data-collection sources: Airbnb's website, user-generated data, listings and questionnaires.

The search through Airbnb's website showed possibilities to include environmental content in various aspects: through a formation/adaption of standards, voluntary incentives, or support and suggestions for hosts' product/service provision. These are further expanded on in the discussion.

In the user-generated content, many hosts suggest new standards or incentives to become a more environmentally sustainable community. Hosts that take environmental initiatives spend time and effort to do so and would like to be recognized for this [9]. Other hosts recognize the potential of the platform to enable higher sustainability in the listing's amenities, in the listing settings checklist, and in the ratings of both guests and hosts [15].

A number of hosts showed support towards Airbnb being a leader in environmental change:

"Airbnb could be the first accommodation chain in the world to lead the way in innovative co-creational change with hosts and guests working towards a better, kinder world." [4]

"Airbnb have created a global community that can lead the move towards supporting progressive companies that make a positive difference to our environment and all living things." [4]

"For me a great thing about Airbnb is the variety of venues and hosts, and the fact that we can each control the way we do things." [11]

Three ways were suggested which would allow environmentally cautious hosts to be distinguished: a club/forum, badges/green ratings, and filters.

An environmental club has been suggested, "to help each other, suggest and exchange ideas, push Airbnb to help us to do more about it." This club should be about reducing ecological footprint, conserving resources, refusing, reducing, reusing and recycling. Another suggestion was to create a forum for Airbnb users with information about sustainable consumerism. This would create an invitation "to the Airbnb community to collaborate and create a new era of possibilities for our planet and all those who live in it." "This forum would provide Airbnb users with information about fair trade, organic or cruelty free products, latest technology and inventions available in all aspects of creating a sustainable home, making it easier for the Airbnb community to learn about new advances in these areas" [4]. A similar suggestion to increase environmental sustainability on Airbnb is through getting hosts in close by locations together to interfere in the existing supply-chains. This way they could jointly buy environmentally friendly products. However, there is no way to contact environmentally-aware hosts at this moment [2].

Five discussions were opened regarding recognition of hosts that take environmentally friendly measures in their properties. One host suggested a badge similar to the Superhost badge for allergen free homes. She imagines it being "like a super host type designation that celebrates having a clean air allergen free home" [10]. Another post suggested to add a green rating, which would reward or rate hosts based on their offer of green features [8]. Sustainability awards were also suggested. These would promote eco-tourism and sustainability through Airbnb. This award would be based on certain sustainability criteria as energy saving, water saving, waste handling. Hosts that offer these kinds of features invested effort into this and want to be recognized for this. This thought was also inspired by the Superhost award. A first thought on the enforcement of this sustainability recognition would

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be through guest ratings. After fulfilling certain criteria, hosts could earn a badge for a sustainable property [9]. Another host suggested a similar "green star program", which would be comparable to existing programs that hotels are using. She suggests enforcing it though earning green stars by complying with a number of responsible conducts [2]. Lastly, a master's student posted on the site with the initiative of creating an environmental certification program [20]. This would be "a voluntary process through which a business receives recognition for demonstrating environmental commitment in their business activities."

Multiple discussions were opened to create a filter to search for environmentally conscious listings. One hosts suggested designations to promote green listings. A green designation of listings would ease the process of finding a green listing [3]. Another suggestion based on personal motivation to protect the environment and allergies is to provide a filter for ecofriendly or chemically sensitive community members. There is no existing filter for this and hosts/guests interested in these topics have to contact hosts/guests directly to find out more, which is inefficient and time-consuming. Community members thus ask for a green category [6, 9, 10]. "[T]here should be a checkbox in the filter section for guests who have allergies to check that would only then list postings that have the word "allergy" somewhere in their description and also enable the host to check a box to indicate that the host is allergy sensitive" Another recommends [10]. host also а direct find way to chemically-free/fragrance-free environmentally-safe listings [14], as currently it is not something that can be found easily. Some hosts express concern because of their experience that guests do not care even if they were explicitly asked for something in house rules, which is why a clear filter/standard is necessary.

The analysis of the listing also showed a great potential to mention environmental aspects directly in one's listings. Many listings mention that they have recently been renovated/refurbished/rebuilt or are modern/new. Many listings include their appliances, amenities, descriptions, but not in terms of efficiency/sustainability. The listings always include a list of amenities included in the property. The possibilities of turning this potential into measures to reduce the environmental footprint of one's property are considered in the discussion.

The questionnaire showed, that even though many hosts do take steps to reduce the negative environmental footprint of their guests, 37 (74%) of them do not mention these steps in their listing descriptions.

To the open questions in the questionnaire, responses showed interest in the topic, saying they have seen interest from others as well. Respondents also recommended that Airbnb could support/reward these initiatives and found this could be enforced and checked through reviews. Tips and tricks to be more sustainable were welcomed, rewards and support towards environmental initiatives from Airbnb are welcomed, voluntary standards are welcomed, or direct ways to affect the use of resources by guests were suggested. It has been stressed, however, that these measures should be implemented on a voluntary basis only.

In addition to this, it seems that the provisions of listings on the platform would not be affected much by incorporating the environment into Airbnb standards, as most hosts would still be interested to host if these existed. 11 (22%) of hosts said they would not be interested in providing their property on Airbnb if Airbnb set stronger environmental standards, while 39 (78%) said they would.

In the end, there is great potential as to how Airbnb could play a role in sustainable tourism provision. This can be done through providing incentives or standards to hosts to reduce the environmental footprints of their properties. Suggestions from hosts themselves from the questionnaire and user-generated data showed interest in this topic. Further potential of the listing descriptions and Airbnb's standards and incentives are elaborated on in the discussion.

# 5 Discussion

Many scholars have found that the sharing economy has impacts on sustainability. So far, the impacts studied most are on social and economic impacts. It may be, that the impact is biggest at the social level, as for example in the case of Amsterdam, where housing prices rose due to the growth of the sharing economy (ING, 2016) which resulted in locals not being able to afford properties in Amsterdam anymore. Since there is little information on the environmental impact of the sharing economy and only one report on the environmental impact of Airbnb, for this thesis I have taken on an explorative research on the environmental sustainability in Airbnb, a prime example of the sharing economy in tourism.

It is important to address this issue and act upon it, as Airbnb has not yet reached its full potential (Ert, Fleischer & Magen, 2016). An increase in hosts and guests will among other result in an increase in the environmental impact caused by this market segment. This is why Airbnb cannot hide behind the positive externalities of the sharing economy anymore, but rather act to reduce the impact caused through this platform.

The aim of this report was to find out whether and how Airbnb tries to reduce the environmental impact caused by renting out properties of hosts on the Airbnb platform. The supply side approach has proven to be more effective than studying the behavior of guests, as many environmentally aware hosts complained about the practices of guests, and opted to take environmental sustainability into their own hands. Not only because it is more effective, but also because it was said, that guests are guests, and should be treated that way. They should not be limited in their comfort, especially not on their holiday.

In the end, this topic remains a subjective topic and opinions and actions will differ based on differences in background, education or culture. In the operationalization, three ways how the environmental impact of Airbnb properties can be addressed were suggested. It seems that currently the second option is taking place, which said Airbnb hosts take measures to reduce the environmental impact caused by the use of their properties without the influence of Airbnb. This is a more positive scenario than that of option three, which says that neither Airbnb nor its hosts act upon the environmental impact created. However, there is potential to create an even lower environmental impact by attempting to reach the first scenario, which

would include Airbnb as the main initiator, creating environmental standards and initiatives for hosts to implement reducing the environmental impact of their properties into their strategy. If not only because of the planet, this strategy can be implemented in terms of corporate social responsibility.

### 5.1 Environmental Measures Taken by Airbnb Hosts

Hosts mention environmentally related factors mainly in terms of water usage, waste, energy use and carbon footprint in their listings. However, most of the descriptions related to these themes regard non-environmental content. The listings thus showed that even though features connected directly to the environment are existent in the properties listed on the Airbnb website, mostly they are not specifically connected to environmental issues in listing descriptions. The user-generated data revealed that on an individual basis, hosts do engage in environmentally sustainable practices, of which the ones most mentioned are: energy use, water use, waste reduction, and the carbon footprint (ranked from most mentioned to least mentioned). It has been found, that some of these steps were motivated by economic reasons rather than environmental ones. Hosts would like to be recognized for these practices and suggested numerous ways to introduce standards. The questionnaire revealed that respondents take measures to reduce the energy consumption, the carbon footprint, to handle waste better and to reduce water use of their guests and properties (ranked from measures taken by most to least hosts). For most part, these measures were taken as own initiatives of hosts.

All in all, the findings show that hosts do take steps to reduce the environmental footprint left by their guests mostly in terms of water use, energy use, waste reduction and the carbon footprint. This confirmed the relevance of environmental indicators mentioned by several studies (e.g.: European Commission, 2015; Cleantech Group, 2014; Rahman, Reynolds & Svaren, 2012; Buckley, 2011; Choi & Sirakaya, 2006; Arena & de Rosa, 2003; Miller, 2001; Buckley, 1996). However, it was found that the carbon footprint compared to the other three indicators energy use, water use and waste is of lower significance. The reason behind this has not been found, but may be because in relative terms the carbon footprint of households is not as big or as obvious as the energy or water footprint. The report by the Cleantech Group (2014) found that Airbnb guests use less energy, water, create less waste and CO2 emissions compared to regular hotel guests. Results of this study show that many hosts take initiatives to reduce the impact in these four spheres. Therefore, it can be questioned, whether the findings of the Cleantech Group are due to the practices of guests, the measures taken by hosts, or in the principle that hotel guests cannot and should not be compared to guests staying in regular homes, as in principle same sized buildings to hotels have a lower environmental impact (Bohdanowicz, 2006).

# 5.2 Airbnb's Role in the Environmental Measures Taken by Hosts

Airbnb's website showed that there are no existing standards concerning the environment. The existing formal and voluntary standards showed no connection to environmental standards. Therefore, the website's results show that currently the role of Airbnb on sustainable environmental practices of hosts is non-existent.

The questionnaire revealed that Airbnb either does not set environmental standards, and if they do, they do so at local levels, as the website analysis showed that they do adapt to local jurisdictions. This can be confirmed by what hosts responded on whether they implement environmentally friendly measures on own initiative or because of Airbnb's standards. Only water measures did not receive a 100% "yes" response. This may mean, that Airbnb takes some kind of measures in for instance areas of drought.

It seems that Airbnb has a very low role on environmentally related practices of hosts. They do not form standards and offer very few incentives for hosts to make listings environmentally friendlier. Whether Airbnb uses an EMS within the corporation is not known, but it can be said with certainty that the platform does not extend any aspects of an EMS onto the platform. Incorporating such a system to the Airbnb platform would require intensive thought, as there is no such system for an online sharing economy platform. However, since the principle of EMSs lays in the improvement of environmental performance without any standardized requirements, its implementation would be possible. Monitoring improvements would, however, be difficult and inaccurate, as properties are usually not only used by guests, but also the owners of these properties. For this reason, it may be smarter to turn to softer systems, as most tourism organizations do (Synergy Ltd, 2000). Ecolabels, which are not yet used within Airbnb, can be an example of such a measure.

The role of Airbnb in the measures hosts take to reduce the environmental impact of guests is low. This confirms my doubt that was expressed in the beginning of this report, asking whether the low environmental impacts of Airbnb found by the Cleantech Group (2014) were intentional or an externality of the principle of sharing. Following the results of this study, it can be assumed, that these were externalities, as no standards or incentives to lower the environmental impact of guests from Airbnb were found. Airbnb should, however increase its role in reducing the environmental impact of its guests, since 4% of Airbnb guests would not have travelled if it wasn't for Airbnb (Nowak et al., 2015), and their operations are still expected to increase.

#### 5.3 Potential to Reduce Environmental Impact of Airbnb

It is relevant to look what steps can be taken by Airbnb to fill its potential to increase environmental sustainability of tourism, as participants of the sharing economy are often motivated by environmental awareness (Gansky, 2010) and concerns (Botsman and Rogers, 2011). The findings show that if the negative environmental footprint caused by renting one's property on Airbnb is reduced, it is reduced by hosts on a voluntary basis. From Airbnb's side, incentives are minimal and standards are currently non-existent. User-generated data and questionnaire responses showed opinions on hosts regarding the potential of the platform.

Suggestions from hosts on online fora offered ways in which Airbnb could increase its participation in decreasing the negative environmental impact of Airbnb. Hosts suggest environmental clubs/fora, environmental badges/ratings, or search filters. Questionnaire respondents also expressed their opinion in open answer questions, welcoming tips and tricks, rewards, support and voluntary standards.

In terms of Airbnb's website, the results show a potential to include environmental content in either creation of new or adaption of existing standards, voluntary incentives, or through support and suggestions for hosts/service provision.

One of the current standards is an accurate list of amenities of one's listing. This existing standard could expand past solely amenities, including a possibility of listing specificities on energy-efficient, environmentally friendly amenities. Another standard could be created that

is similar to the non-discrimination policy of Airbnb. In addition to inclusion and respect that the non-discrimination policy puts emphasis on, respect to our planet could be added. Airbnb's strong stand on their low environmental impact leaves an open door to including environmental awareness into one of their standards.

The Superhost badge shows an example of a way how to distinguish hosts that are environmentally friendly. Environmentally friendly hosts could receive a badge just like Superhosts do. This badge could also result in a filter, similar to the Superhost filter. This would be a voluntary incentive for environmentally sustainable hosts and guests, which are currently difficult to find based on these features.

The potential to encourage hosts to take more sustainable measures in their homes remains unused, even though Airbnb continuously announces the environmental benefits of home sharing and the importance of sustainable tourism. Support for hosts could be enacted through simple tips and tricks sections, that already exist for different topics. Furthermore, if an environmentally-friendly badge were to exist, a mentor program for environmentally aware hosts could be created, similar to the existing Mentor program. The existing partnerships discussed above show that Airbnb is taking some initiatives. However, Airbnb's potential is far greater than the few existing partnerships.

Potential in one's listing lays in simple things. Many listings mention that they have recently been renovated/refurbished/rebuilt and/or are modern/new, etc. In many cases, this could mean efficient appliances, but this is not mentioned. Listings also mention descriptions of properties and specific features of their properties as for instance lamps, bathroom facilities, heating, kitchen appliances, washing machines/dryers, but not in terms of efficiency or sustainability. Trash is also mentioned in several listing descriptions, but could be expanded by motivating guests to separate/recycle. Listing descriptions also often include "to-do" tips for guests, which could be expanded by supporting local businesses. This could also be solved from the side of the platform. Currently, Airbnb tells hosts to tick off a standardized list of amenities (see appendix 5) which is included in the description of one's listing. This list could include features like ticking off efficient appliances, solar energy, etc.

Questionnaire responses revealed, that only 11 out of the 50 respondents (22%) would not be interested in providing their property on Airbnb if they were to set stronger environmental

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standards. This number may be larger due to the perception that these standards would be mandatory. After seeing the results of the content analysis, it is my belief that upon implementation of voluntary, and not mandatory standards, Airbnb would not lose this 22% of hosts.

Looking at the possibilities of the platform and comparing to the already discussed EMS in the previous section, the soft approach of TUI can be seen as a prime example for Airbnb. Airbnb could start fulfilling its potential of environmental sustainability in a very similar way. TUI does not have an official ecolabel, but is environmentally conscious. The company does this through encouraging environmental management in hotels that the company lists, through providing customers with information on environmental aspects of the hotel the company offers, through requiring filling an environmental checklist from hotels, and through collecting more information on these aspects from guests and employees on the ground (Buckley, 2001). A very similar procedure could be enforced by Airbnb through encouraging hosts to be more environmentally friendly, through including information on the listing descriptions of the platform, through adapting the checklist of listing amenities to include the property's environmental features, and through verifying this information through reviews by guests. Creating these measures would also shift the responsibility of environmental action not only to hosts, but also to guests (Buckley, 2001).

### 5.4 Limitations and Suggestions for Future Research

The time restriction of this research resulted in some limitations. An increased time-span would allow me to conduct the content analysis before starting to collect data for the questionnaire. For this study, these have been done simultaneously. Conducting the analysis of texts first would allow for a more specific questionnaire since I would have had more knowledge on specific questions asked in the questionnaire. Possibly, more time for data collection could have increased the sample size for the questionnaire. A larger sample size for both the questionnaire and the texts that were analyzed would increase the external validity of this research in terms of generalizations onto larger samples.

The low number of responses for the questionnaire meant that only simple descriptive statistical analysis could be performed on the results. The limited sample did not give much

opportunity to conduct comparative analyses for example between entire homes and private rooms, or between those who joined Airbnb earlier or later, or between different geographic locations. Intentions to perform more detailed statistical analysis were made, but were unsuccessful and unrepresentative, as for example a cross-tabulation between the variable of types of properties and the number of measures to reduce energy consumption of guests. This resulted in very similar results for both groups, as 29 (entire homes/apartments) and 21 (private rooms) responses were spread between zero and five measures taken to reduce energy use. A study with a higher number of responses could expand on statistical analyses, as with a larger sample, these kinds of comparisons could show interesting results, and could for example specify a target group that should be addressed.

Interviews could be a good additional source of information, as they would provide clarification in terms of what role Airbnb currently has in reducing its negative environmental impact, and feedback on suggestions for standards/voluntary incentives that were found. For the scope of this explorative research, interviews were not necessary, but since it would be interesting to see whether Airbnb is already thinking of taking more measures in the direction of lowering its environmental footprint, this is suggested for a future study.

The study of the Cleantech Group (2014) compared Airbnb to sustainable hotels in terms of environmental performance. The results showed Airbnb properties have a lower environmental impact compared to hotels. However, this research showed that no major steps were taken from the side of Airbnb to address environmental impacts. I believe, another study which compares properties that are rented out through Airbnb to properties not rented out through Airbnb (instead of hotels) should be conducted. This would give a more valuable comparison, as Airbnb promotes the view of Airbnb guests to be as locals, rather than being a traditional tourist. This is why their consumption and environmental impact should also be compared to locals, and not to tourists. Seeing this comparison would present the real impact Airbnb guests cause and potentially motivate Airbnb to take further steps to lower its environmental impact.

Lastly, results showed, that Airbnb hosts engage in environmentally friendly practices, that Airbnb does not motivate these practices to a bigger extent yet, and that the platform has great potential to reduce the environmental footprint caused by its existence and use. Further research should address which of the many potentials Airbnb should implement, to see which would have the biggest positive impact on the environment and to see which would be the ones most widely accepted by hosts.

# 6 Conclusion

A prime example of an online platform in the sharing economy in the tourism industry has been researched in this report. Airbnb has been analyzed to study its role in sustainable tourism provision. The main research question "(How) do Airbnb hosts reduce the environmental impact of their properties, and what is the role of Airbnb in this?" has been answered by three specific research questions. To gain insights, texts were gathered and questionnaire responses were collected, which were analyzed with content analysis and descriptive statistical analysis. Results showed that Airbnb takes very limited measures to reduce the negative environmental impact that was created through the possibilities of this platform. To some extent, hosts try to lower this impact on an individual basis, based on voluntary initiatives rather than incentives from Airbnb. This study showed an extensive potential of the platform to incorporate environmental sustainability into its strategy. Numerous examples to include environmental initiatives or standards on the Airbnb platform were given and described in the results and discussion sections.

Knowing that Airbnb has not yet finished in expansion increases the need to fill this unfulfilled potential. The company TUI has been suggested as a good example for Airbnb to implement environmentally friendly practices within its platform, as TUI's environmental steps have been evaluated as being most similar to the potential that Airbnb has to include environmental management in their operations. Airbnb's management is the actor that can affect the reduction of the environmental impact caused by the existence and use of its platform most, and could potentially incorporate this into their corporate social responsibility activities. Implementation would have to come from the side of Airbnb hosts. Embracing the opportunity to extend Airbnb's mission with an environmental strategy would then leave the choice between properties with different levels of environmental friendliness in the hands of guests.

# Acknowledgements

I would like to thank my supervisor Dr. Machiel Lamers for his expertise, guidance and suggestions while at the same time giving me the freedom to elaborate on my own creativity.

I also want to thank and acknowledge the people that found the time to fill in and spread my survey. Their time and effort was greatly appreciated.

Last, but not least I would like to thank my friends and family for their help, not only for being a source of energy, but also for helping me improve this work.

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# Appendices

# Appendix 1. Questionnaire to Airbnb hosts.

General Information					
1.	1. When did you join Airbnb as a host?				
	> Year				
2.	Where is your listing	located? (in ca	se of multiple listings, pl	ick one for the en	tire survey)
	> Country		5 7 577	2	
3.	What kind of place a	are you sharing?			
	Entire h	ome/apartmen <sup>.</sup>	t		
	Private I	Room			
	Shared I	Room			
Air	bnb's Standards				
4.	Airbnb sets several s	standards to ho	sts (e.g. cleanliness, accu	uracy, communic	ation). When did
	Airbnb check the im	plementation o	f their standards?		
	Before your listing has been approved				
	After yo	ur listing has be	en approved		
	Never				
	Other:				
5	To what extent door	Airbab cot onv	ironmontal standards?		
5.	TO What extent does	All blib set env			
	Not Si	mall	Moderate extent	High	Very high
	at all ex	xtent	moderate extern	extent	extent
6.	In which areas does	Airbnb set envi	ronmental standards? ((	Only answer if Air	bnb sets any
	environmental stand	lards. Tick all a <sub>l</sub>	oplicable answers.)		
	Energy ι	lse			
	Water u	se			
	Waste				
	CO2 em	issions			

# Energy use

None

Other: .....

7. What kind of measures do you take to lower the energy consumption of your guests? (Tick all applicable answers.)

 I have a Smart Meter
 I use LED lightbulbs (or other energy saving lightbulbs)
 I use energy efficient appliances
 Other: ......
 None

- 8. Which of your appliances are energy efficient (energy label A or higher, or other equivalent label)? (Only answer if you use energy-efficient appliances. Tick all applicable answers.)
  - Fridge Freezer Washing machine Dish washer Stove Oven Microwave Air conditioner Water heater All my appliances are energy efficient
- Were these steps taken voluntarily?
   Yes, it was my own initiative
   No, they were taken because of Airbnb's requirements/suggestions
   Other: .....

#### Water use

10. What kind of measures do you take to lower the water use of your guests? (*Tick all applicable answers.*)

- I have a Smart Meter I have a high-efficiency shower(head) I have a 3L flush/electric toilet I re-use water I collect rainwater for own use None Other: .....
- 11. Were these steps taken voluntarily?
   Yes, it was my own initiative
   No, they were taken because of Airbnb's requirements/suggestions
   Other: .....

#### Waste

12. What kind of measures do you take to lower the waste of your guests? (Tick all applicable answers.)

I encourage guests to recycle
I have a compost pit in my garden
I provide reusable shopping bags for my guests
None
Other: ......

13. Were these steps taken voluntarily?

Yes, it was my own initiative
No, they were taken because of Airbnb's requirements/suggestions

# Carbon footprint 14. What kind of measures do you take to lower the carbon footprint of your guests (Tick all applicable answers.): I use energy-efficient appliances I buy renewable energy (solar, wind, etc.) I provide guests with information on public transport/car-sharing rather than renting a car I provide guests with bikes I provide my guests with vegetarian recipes I offer an option to plant a tree Other: ..... None 15. Were these steps taken voluntarily? Yes, it was my own initiative No, they were taken because of Airbnb's requirements/suggestions Other: .....

# "My" listing

16. On my listing description, I mention the following features of my home that reduce the environmental impact of my guests (*Tick all applicable answers.*):

Energy efficiency Water efficiency Waste efficiency Reduced CO2 emissions None Other: .....

17. Do you take any other measures to lower your guests' impact on the environment?> Open answer

Airbnb				
18. Do you think Airbnb s	hould do more ab	out its potential to	o reduce the negative	environmental
impact of its users?				
Yes				
No				
19. Would you still be interested to host if Airbnb set stronger environmental standards?				
Not at all	Not very	Neutral	Somewhat	Very
interested	interested		interested	interested
20. Do you have other con Open answer	nments regarding	; the environment	al impact of your gues	sts?

Appendix 2. Web pages used for content analysis of Airbnb standards.

	Onlin	ne Content: Airbnb Standards
I	[1]	https://www.airbnb.com/standards
	[2]	https://www.airbnb.com/hospitality
	[3]	https://www.airbnb.com/mentors?c=tumblr⁡=746240
	[4]	https://www.airbnb.com/help/article/576/what-are-airbnb-s-hosting-standards
	[5]	https://www.airbnb.com/hospitality#about
	[6]	https://www.airbnb.com/help/article/1526/what-are-hosting-standards-for-
		professionally-managed-properties-on-airbnb?topic=206
	[7]	https://www.airbnb.com/help/article/1199/what-are-airbnb-s-standards-and-
		expectations?topic=250
	[8]	https://www.airbnb.com/help/article/279/what-is-the-airbnb-host-guarantee
	[9]	https://www.airbnb.com/help/article/1405/airbnb-s-nondiscrimination-policyour-
		commitment-to-inclusion-and-respect
	[10]	https://www.airbnb.co.uk/press/news/new-study-reveals-a-greener-way-to-travel-
		airbnb-community-shows-environmental-benefits-of-home-sharing

[11] https://press.atairbnb.com/earth-day/

Appendix 3. Web pages used for content analysis of user-generated data.

Onlin	Online content: User-generated Data		
[1]	http://airhostsforum.com/t/can-i-ask-guests-to-conserve-energy/13938		
[2]	https://community.withairbnb.com/t5/Community-Help/An-Airbnb-Environment-		
	Club/m-p/124746/highlight/true#M6226		
[3]	https://community.withairbnb.com/t5/Hosts/We-are-a-lush-and-quot-green-quot-		
	environment-are-there-any/m-p/90422/highlight/true#M28145		
[4]	https://community.withairbnb.com/t5/Where-in-the-World/Information-ETHICAL-		
	SUSTAINABLE-CHOICES/m-p/293510/highlight/true#M1642		
[5]	https://community.withairbnb.com/t5/Hosts/Energy-efficiency-remind-guests-to-		
	switch-off-lights/m-p/355583/highlight/true#M80744		
[6]	https://community.withairbnb.com/t5/Host-Voice/Filter-for-Eco-friendly-		
	chemically-sensitive-people/idi-p/162941		
[7]	https://community.withairbnb.com/t5/New-Hosts/conserving-energy/m-		
	p/202895/highlight/true#M19247		
[8]	https://community.withairbnb.com/t5/Host-Voice/Add-a-quot-Green-quot-		
	Rating/idi-p/163038		
[9]	https://community.withairbnb.com/t5/Hosts/Sustainability-Awards/m-		
	p/62272/highlight/true#M16733		
[10]	https://community.withairbnb.com/t5/Host-Voice/Allergen-free-homes/idi-		
	p/162399		

- [11] https://community.withairbnb.com/t5/Hosts/Point-of-Difference/mp/114427/highlight/true#M33143
- [12] https://community.withairbnb.com/t5/Community-Help/Superhost-of-3-years-leftout-in-the-cold-by-Airbnb/m-p/262323/highlight/true#M30296
- [13] https://community.withairbnb.com/t5/Where-in-the-World/Hey-are-youpromoting-LOCAL-Here-s-how-amp-why-you-should/mp/312047/highlight/true#M1698
- [14] https://community.withairbnb.com/t5/New-Hosts/How-can-I-list-and-find-otherchemical-free-environmentally-safe/m-p/62045/highlight/true#M6656
- [15] https://community.withairbnb.com/t5/Host-Voice/Encourage-hosts-and-guests-tobe-more-green/idi-p/162306
- [16] https://community.withairbnb.com/t5/Help/Waste-Not-Want-Not/td-p/381247
- [17] https://community.withairbnb.com/t5/Hosts/Wasteful-Guests-and-Greedy-Suppliers/m-p/292449/highlight/true#M67724
- [18] https://community.withairbnb.com/t5/Community-Help/Encouraging-Guests-to-Conserve-Water/m-p/353248/highlight/true#M48500
- [19] http://airhostsforum.com/t/new-supplies-for-every-guest/12372
- [20] http://airhostsforum.com/t/seeking-toronto-hosts-for-environmental-certificationresearch/9357
- [21] http://airhostsforum.com/t/toiletries-options-for-guests/14204/4
- [22] http://airhostsforum.com/t/inverter-air-conditioner-vs-regular-airconditioner/14304
- [23] http://airhostsforum.com/t/energy-efficiency-question/9279
- [24] http://airhostsforum.com/t/reducing-energy-usage/5777/3
- [25] http://airhostsforum.com/t/can-you-share-your-house-rules/7090
- [26] http://airhostsforum.com/t/trash-separating-into-8-categories/7190
- [27] http://airhostsforum.com/t/guests-leaving-lights-fans-on-and-windows-wideopen/3871

Appendix 4. Airbnb Standards.

Community Standards		
Safety	Safety is the first priority of Airbnb. The platform bans	
	endangering and threatening.	
Security	Airbnb asks both hosts and guests respect each other's properties	
	and not take property that you do not own. Furthermore, it	
	cautions its users not to use payment methods other than	
	Airbnb's official payment system. Users are not allowed to use	
	other user's accounts without permission. Recording of guests is	
	not allowed without disclosure of this in one's listing.	
Fairness	Airbnb believes fairness is the foundation of trust. Discrimination,	
	hate, bullying, harassment and disturbance of the surrounding	
	community are not accepted within the community.	
Authenticity	Data on one's profile must be truthful. Spaces must be	
	represented reliably in one's listing. Misrepresentation of both	
	oneself and a property is a violation of Airbnb's standards. Airbnb	
	bookings should not be seen as only transactions, rather as	
	experiences.	
Reliability	Only places that are inhabitable, in terms of cleanliness, water	
	and electricity availability should be provided. Properties	
	provided on Airbnb must be stationary and real spaces. As a host	
	and a guest, you should not break commitments towards the	
	booking. As a member of the community, you should aim to	
	improve your ratings and be responsive and in contact with your	
	host/guest.	

Hospitality Standards		
Availability	Hosts should only confirm a reservation if sure they will be able	
	to host. Therefore, the listing's calendar should be updated	
	regularly.	
Communication	Timely responses and support of guests before and during their	
	stay is important and is rated by guests after their stay.	
Commitment	Once you confirm a request, hosts should be committed, as an	
	unexpected change in accommodation is disturbing for guests.	
Check-in	Hosts are asked to provide care for their guests, make them feel	
	comfortable and welcome. Check-in should be clear and simple.	
Accuracy	Information on listings about your property and amenities should	
	be detailed and accurate. [5] The price should be representative	
	of what guests will find upon their arrival.	

Cleanliness	Hosts should make sure to have enough time between bookings
	to clean, as the property should be clean and tidy upon a guest's
	arrival.
<b>Overall Experience</b>	Hosts are rated on overall experience, which appears in the
	searching results. Here guests also rate the value of the listing, so
	the price should be balanced with expectations.
Additional standards	Professional hospitality managers are allowed on the Airbnb
for professional	platform if their properties offer unique features. Examples of
hospitality managers	these are: 25 or less rooms, personal touch to rooms, unique
	design, local touch. Furthermore, hosts must comply with the
	regular hospitality rules.

Non-discrimination Standards		
Inclusion	All members of the Airbnb platform belong to the Airbnb	
	community, no matter their background (race, religion, national	
	origin, etc.). No bias, prejudice, racism or hatred is tolerated. The	
	Airbnb inclusion aims to exceed the minimum requirements given	
	by relevant laws.	
Respect	The Airbnb community is respectful towards each other, no	
	matter the beliefs or differences in upbringings. Airbnb is about	
	diversity of experiences, beliefs and customs. These differences	
	should foster mutual understanding and appreciation and defy	
	prejudice.	

#### ΨQ Kitchen - Smoking allowed Amenities φ Internet Wheelchair accessible ₩ TV Elevator in building 🕅 Indoor fireplace Essentials Buzzer/wireless 📋 Shampoo intercom A Heating Doorman ☆ Air conditioning Pool 🗑 Washer Hot tub 🖲 Dryer Gym P Free parking on 스 Hangers premises 🖾 Iron 🗟 Wireless Internet ° P≈ Hair dryer Cable TV 🖳 Laptop friendly Breakfast workspace Pets allowed Private living room So Family/kid friendly Private entrance Suitable for events Family amenities Baby bath Game console High chair Baby monitor **Babysitter recommendations** Outlet covers Bathtub Pack 'n Play/travel crib Changing table Room-darkening shades 🖏 Children's books and Stair gates toys Table corner guards Children's dinnerware Window guards Crib Fireplace guards

# Appendix 5. List of Amenities in an Airbnb listing.