Attention and sentiment of Chinese public toward green buildings based on Sina Weibo

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Abstract

Energy conservation and consumption reduction in the field of construction are the keys to achieving the target global temperature growth of the Paris Agreement. However, the current promotion of green buildings is still stuck in the rut of government excessive intervention, market less participation. In order to explore the status of the Chinese public's attention, changing trends, sentiment orientation, and focus toward green buildings, this paper collected and analyzed information of Weibo users and posts and comments of popular posts related to green buildings. We used the Sina Weibo platform with web crawler technology and a text mining method. The results showed that: the public's attention toward green buildings has enhanced significantly with the change of government governance ideas, but still needs to be improved. Although vertical greening houses possess good heat preservation and thermal insulation, 46.32% of the Chinese public has negative sentiments toward vertical greening houses mainly due to worries about the increase in snakes, and mosquitoes and other insects caused by the increased vegetation cover. Price is not the main reason why the public has negative sentiments toward vertical greening houses.

1. Introduction

In the face of climate changes and the conflict between the rapid growth of populations and limited resources, the consensus is that reducing carbon emissions and improving energy efficiency is required for the sustainable development of all countries (Espinoza, Buehlmann, & Smith, 2012; Swilling & Hajer, 2017). The three major high-energy-consuming fields are construction, industry, and transportation. The energy consumption of construction has already exceeded that of industry and transportation, accounting for more than 40% of the global energy consumption (International Energy Agency (IEA, 2010). Therefore, energy conservation and consumption reduction in construction are the keys to achieving the target global temperature growth of the Paris Agreement. With the advantages of being more energy-efficient, more comfortable, and more environmentally friendly, green buildings are becoming the development trend in the construction industry. Many evaluation standards for green buildings, such as the American LEED, British BREEAM, Canadian GBTools, and Chinese national standard GB/TS0378-2006 Assessment Standard for Green Building, have been published to promote the development of green buildings (Juan, Hsu, & Xie, 2017). However, after years of promotion, the response of the consumer market to green buildings has been limited, and the current development of green buildings is still stuck in the rut of government excessive intervention, market less participation (Wang & Zhang, 2017). The 19th CPC National Congress report pointed out that efforts should be made to establish an environmental governance system in which government takes the lead, enterprises assume the main responsibility, and social organizations and the public also participate. Meanwhile, the newly revised Environmental Protection Law of the People’s Republic of China, the Measures for Public Participation in Environmental Protection, and the Guiding Opinions on Promoting Public Participation in Environmental Protection in China have also made clear the importance of public participation (Espinoza et al., 2012). Public participation has been getting more and more attention in environmental governance.

Based on the technology acceptance model, the public needs to experience the following process when accepting new things: pay attention to the new things and perceive their characteristics, generate sentimental preference to these new things, and then produce a behavioral intention. As high-quality buildings, the development of green buildings depends on the social and economic development of the region. The public's attention toward green buildings also depends on their own social and economic conditions. Under the background of China's social and economic development, the public's attention toward green buildings has not been effectively expounded in the existing literature. Additionally, the existing related studies are mainly static...
studies, and have not considered the development of society and the economy. Furthermore, the existing studies on public sentiment toward green buildings are mainly focused on user satisfaction of the indoor environmental quality of green buildings, while the public’s sentiment orientation and focus toward the whole green building remain unclear.

Sina Weibo, a mainstream social media platform in China with 340 million active monthly users and a high level of user contributions, is a suitable platform to study the Chinese public’s attention and sentiment toward green buildings. This paper studied the public’s dynamic attentions and sentiment toward green buildings by using Sina Weibo platform combined with web crawler technology and a text mining method. We put forward suggestions to popularize green buildings in China. This study made three contributions to the literature. First, Weibo user behaviors were used to analyze public attention and sentiment toward green buildings, which is helpful for similar studies about public attitude toward new products or services; second, we explored the Chinese public’s attention status and changing trends toward green buildings; and last but not the least, taking vertical greening houses for example, we studied the Chinese public’s sentiment orientation and focus toward the whole green building.

The rest part of the paper is organized as follows: Section 2 reviews the literature about public attention, sentiment, and acceptance toward green buildings. Section 3 delineates the methodology issues, which includes web crawler technology and the text mining method. Section 4 presents and discusses the results. Conclusions are drawn and suggestions are put forward in Section 5.

2. Literature review

2.1. Public attention toward green buildings

Attention refers to special care or treatment. To address climate and environmental issues and promote sustainable development, North America, Europe, Australia, Singapore, South Korea, and other regions and countries have issued a large number of regulations, directives, and initiatives to raise environmental awareness and sustainability in the construction sector (Hwang, Zhao, & Leong, 2015; Kylili & Fokaides, 2017). As a great power in the construction industry, China has been committed to consolidating the establishment of low-carbon communities in recent years, and has realized a great-leap-forward in development (Small, 2009). Maslow’s hierarchy of needs holds that the hierarchy of people’s needs can be divided into physiological needs, safety needs, social belonging, esteem, and self-actualization, from low to high. People have a dominant need at each stage, and at different hierarchies of needs, people’s requirements for products are different (King-Hill, 2015). As high-quality buildings, green buildings can not only satisfy people’s physiological and safety needs, but also meet high-level needs (Li, Yan et al., 2014). However, as a special product, the properties of these buildings are subject to the level of social and economic development of regions; the hierarchy of public needs for buildings is also related to these social and economic conditions. As a result, green buildings still develop slowly in emerging countries, while traditional non-green buildings still play a dominant role (Hwang et al., 2015). Li, Yang, He, and Zhao (2014) pointed out that, at present, Chinese residents are most concerned about price and location instead of green-related features when buying houses. Moreover, Durdyyev, Zavadskas, Thurnell, Banaitis, and Ihtiyar (2018) conducted a questionnaire survey among Cambodian building professionals to evaluate their perceptions of sustainable construction. The study showed that the building industry seldom conducted sustainable construction due to a lack of awareness and related knowledge, and they were unwilling to adopt new sustainable materials.

Although the concept of green buildings has been growing rapidly, the primarily emphasis has been on energy-saving designs, with little attention paid to sustainable post-occupancy operations (Li, Ng, & Skitmore, 2018). Furthermore, residents in different countries show diversity in their attention to the properties of green buildings (Luo, Kanzaki, & Matsushita, 2017; Shafei, Samari, & Ghodratii, 2013). Bertone et al. (2018) indicated that although public building retrofitting can reduce water and energy consumption and the payback period of which is not long, the reconstruction rate is low in most countries. The focus of project reconstruction is often limited to energy, while water conservation and the relationship between water and energy are often ignored.

2.2. Public sentiment toward green buildings

2.2.1. Connotation of sentiment

Sentiment refers to an individual’s attitude and experience of whether objective things meet his/her needs, and includes expressions such as like and disgust (Fei, 2012). The public sentiment toward green buildings is the public’s attitude and experience of whether green buildings meet their needs. Different scholars put forward different views on the dimensional categories of sentiment. Wundt argued that sentiment has three dimensions: pleasantness-unpleasantness, tension-relaxation, and excitement-inhibition. However, Titchener thought that tension-relaxation and excitement-inhibition put more emphasis on the body’s feelings. Therefore, he rejected Wundt’s opinion and proposed that sentiment only have 1 dimension, that is, pleasantness-unpleasantness (Xie, 2006). Moreover, in the traditional Chinese view of sentimental thought, there are various statements such as 7 sentiments, 6 sentiments, 5 sentiments, and 3 sentiments (Wang, Richard, & Esther, 2013). Based on the basic affect schedule, Wang et al. (2013) divided sentiment into 2 dimensions: positive sentiment and negative sentiment. The broaden-and-build theory of positive sentiment states that positive sentiment is more helpful to expand the range of attention, cognition, and behavior than negative sentiment (Fredrickson, 1998). At present, scholars have reached a high consensus on the relationship between sentiment and behavior, that is, sentiment has a significant impact on behavior, and compared with cognition, sentiment has a stronger impact on behavior (Wang & Jing, 2012).

2.2.2. Expression of sentiment

The existing studies have analyzed the public sentiment toward green buildings from the perspective of the public’s experience of indoor environment of green buildings. These buildings included office buildings, housing, and schools. Most scholars’ studies showed that the public has a higher satisfaction with the indoor environment of green buildings than that of conventional buildings. Liang et al. (2014) investigated and compared the quality of the indoor environment of green office buildings and conventional office buildings in central Taiwan when using air conditioners. The results showed that the overall satisfaction of the green office buildings was higher than that of conventional office buildings, and in specific areas of the indoor environment’s quality assessment, such as acoustics, lighting, thermal comfort, and air quality, the average satisfaction scores of green office buildings were higher than those of conventional office buildings. Lee, Huh, and Park (2016) carried out a study on public satisfaction with the green housing roof project in Changwon, South Korea, showing that 64.8% of the respondents held positive sentiments toward the project. Through a survey of 10 conventional, 20 energy retrofitting, and 3 green schools in Toronto, Canada, Issa, Rankin, Attalla, and Christian (2011) found that, in general, compared with teachers in other schools, teachers in green schools were satisfied with the lighting, thermal comfort, air quality, heating, and ventilation of the classroom and personal workspace, but were not satisfied with the acoustics.

Meanwhile, some scholars pointed out that public satisfaction with the indoor environment of green buildings was not significant compared with that of conventional buildings. Based on the relevant data of 144 buildings (65 with LEED certification) and 21,477 respondents (10,129 in LEED-certified buildings), Altomonte and Schiavon (2013) found that LEED certification had no significant effect on user
satisfaction with the indoor environment. Zalejska-Jonsson (2012) conducted a questionnaire survey among residents in three carefully-selected low-energy consumption residential buildings and three conventional residential buildings to discuss the buildings’ performances from the perspective of their residents; the authors also compared the satisfaction with the indoor environment. The results showed that there were satisfied and less-satisfied residents in both low-energy and conventional residential buildings, and this satisfaction could decrease if thermal discomfort led them to use supplementary heating. Aiming at the mixed results, this paper considers that different green building evaluation standards have different identification standards. Even if the same types of buildings are identified by the same green building evaluation standard, their green performances are not exactly the same. Moreover, public satisfaction with the indoor environment of green buildings is also related to the quality of the outdoor environment, public expectations, public living habits, and other factors; therefore, the conclusions drawn by different scholars appear inconsistent.

2.3. Public acceptance of green buildings

Although green buildings have many advantages in saving energy, saving land, saving water, saving material and protecting the environment, there are still some obstacles for the public to accept green buildings. At first, the low acceptance of green buildings was thought to be attributed to technology and economy. Tseng and Hung (2013) adopted the Service Quality Model and SERVQUAL scale to study the gap between expectations and perceptions of consumers toward green products. It was concluded that there is a gap between expectations and perceptions of consumers, among which the environmental performance of green products has a larger gap. Ku, Chi, Chang, and Lin (2014) argued that the main obstacles to the public acceptance of green buildings are higher material costs for green buildings, imperfect housing markets, and lack of green building products.

People are increasingly aware of the importance of social and psychological factors. According to Hoffman and Henne (2008), the obstacles to the promotion of green buildings are no longer mainly technical and economic factors but social and psychological factors. Based on the hypothesis of social dilemma theory, green consumption was considered a typical social dilemma scenario (Wang, 2015). The public often adopts instrumental rationality to face the promotion of green buildings, together with the government excessive intervention for promotion, placing the public in a passive position in the development of green buildings. Using data from more than 3100 technical facilities under the Irish government’s Green Home Plan, Kennedy and Basu (2013) conducted an empirical study to assess the extent to which policymakers can learn about the willingness of consumers to adopt technology in their homes. The study showed that although the economic factor is significant when considering the adoption of renewable energy technologies, social determinants, product reliability, consumer confidence, environmental impact assessment, and environmental awareness also need to be considered. Darko, Chan, Ameyaw, He, and Olanipekun (2017), through a questionnaire survey of 33 green building experts in the United States, drew a conclusion that the resistance to change, lack of awareness and knowledge, and high cost are important obstacles to the adoption of green building technology. Meanwhile, the driving factors for the acceptance of green building technology are energy and water efficiency, and the image and reputation of the company the building is constructed for. Liu et al. (2018) used an extended technology acceptance model to explore the influence of psychological factors on Tianjin residents’ acceptance of green housing. The study showed that the lack of subjective knowledge and social trust are the psychological obstacles preventing residents from accepting green housing. Furthermore, considering the customer expectations for comfort, hotel stakeholders are still hesitant to build green buildings (Cracknell & Abu-Hijleh, 2015). Hong and Noh (2014) suggested that the lack of understanding of the concept of a green library is the main influencing factor for the difficulties in building a green library.

Deficiencies have been found in the existing studies through literature review. First, the public’s current attention (at the national and regional levels) toward green buildings in China are not clear. Second, the public’s attention toward changing trends in green buildings with the development of the social economy in China has not been effectively described. Third, further studies on the public sentiment toward the whole green building are required.

3. Method

3.1. Web crawler technology

With the popularity and prosperity of the Internet, network information resources have shown explosive growth. In order to make effective use of network resources, web crawler technology has emerged (Hu, Ge, & Hou, 2014). Web crawler technology is a technology of automatically collecting required information from 1 or more pages based on a certain strategy and is a way to access network resources by a simulated browser (Kauras, Dhaka, & Singh, 2013). According to various collected objects, used system structures and implemented techniques, web crawlers are divided into four types: the general-purpose web crawler, the focused web crawler, the incremental web crawler, and the deep web crawler (Batsakis, Petrakis, & Milios, 2009). In this paper, focused web crawler technology was used to collect the information needed, and the detailed principle is shown in Fig. 1.

Octopus is a mature application software of web crawler technology. This paper collected information based on Octopus v7.1.6. The steps for collecting information were as follows:

1. Simulated login. We used the username and password of a Sina Weibo account to realize simulated login on the Sina Weibo platform.

2. Web page downloading and data filtering. After simulated login, the initial link that defined the information collection was http://s.weibo.com/?topnav=1&wvr=6. Based on the concept and connotation of green buildings, “green building”, “ecological building”, “energy-saving building”, and “low-carbon building” were used as topic keywords to search the information of Weibo users and Weibo
posts.  

(3) Key content collection. When collecting the information of Weibo users, we collected the username, region, introduction of user, number of followers, number of Weibo posts, and authentication condition; when collecting the information of Weibo posts, we collected the username, content of the post, number of collections, number of reposts, number of comments, number of likes, and post time. According to the number of collections, reposts, comments, and likes of the Weibo posts, we screened out the popular Weibo posts. Finally, when collecting the information of comments of the popular Weibo posts, we collected the username, content of comments, and post time.

(4) Information storage and export. After all contents were collected, a repetition test was conducted, and then all the information was exported.

Some of the Python codes are as follows.

```python
# coding: utf-8
import sys
import urllib
import urllib2
from BeautifulSoup import BeautifulSoup

question_word = "green building, ecological building, energy-efficient building, low-carbon building"
url = "https://s.weibo.com/top/summary?l=6" + urllib.quote(question_word, encoding="gbk")
htmlpage = urllib2.urlopen(url).read()
soup = BeautifulSoup(htmlpage)
print len(soup.find_all("table", {"class": "result"}))
for result_table in soup.find_all("table", {"class": "result");
  a_click = result_table.find("a")
  print "****user name----" + a_click.renderContents() + "**name"
  print "****link----" + str(a_click.get("href")) + "**link"
  print "****introduction----" + result_table.find("div", {"class": "c-abstract"}).renderContents() + "**introduction"
```

(2) Construction of sentiment dictionary

The sentiment dictionary included a word segmentation dictionary and a sentiment word dictionary. The word segmentation dictionary was used to split sentences of comments and extract words and emoticons from the comments, while the sentiment word dictionary was used to classify words and emoticons after word segmentation, and assign sentiment values according to the sentiment strength of words and emoticons. The NLPIR big data analysis platform uses the ontology database of Chinese affective vocabulary constructed by Dalian University of Technology as the sentiment dictionary, which was constructed on the basis of Ekman’s six basic universal emotions. This dictionary included parts of speech, sentiment category, sentiment intensity, sentiment assignment, and other information from the words.

3.2. Text mining method

Text mining is a computer processing technology of extracting valuable information and knowledge from text files (Chen, Han, Meng, & Dai, 2017). Through text mining, we can obtain the public attention status and changing trends toward green buildings. Text sentiment analysis, also known as opinion mining, refers to the analyzing, processing, inducing, and reasoning processes aimed at the subjective texts with sentiments (Chaturvedi, Cambria, Welsch, & Herrera, 2018). Based on the information collected, we adopted the natural language process & information retrieval (NLPIR) big data analysis platform of the Beijing Institute of Technology to conduct sentiment analysis on the comments of popular Weibo posts. From this, the sentiment orientation and focus of the Chinese public toward green buildings could be obtained. The steps were as follows:

(1) Denoising

After collection, we first removed the information with disordered formats and missing content. There were some repetitive and meaningless information in Weibo comments, such as advertisements, forwarding, and information with too few words and no actual information. In addition to user responses on Weibo posts, the comments contained irrelevant information about the communication between users. Therefore, the information collected was further cleaned.

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4. Results and analysis

4.1. Public attention status toward green buildings

Weibo users include authenticated users and non-authenticated users. Authenticated users consist of institutional and individual authenticated users. Institutional and individual authenticated users are both real-name authenticated users, and their Weibo accounts are in good operation (with authentic and representative activity), and their behaviors can better reflect the public’s attention toward green buildings than non-authenticated users. Furthermore, due to the current limited access of keyword search and collection on the Sina Weibo platform, only the search results of the first 50 pages can be collected. Fortunately, all the authenticated users’ information based on the four keywords searches within the collection permission can be obtained. Therefore, we conducted an information search, collection and analysis of institutional and individual authenticated Weibo users in the field of green buildings. Finally, a total of 956 Weibo users were obtained, including 825 institutional authenticated users and 131 individual authenticated users. The data collection ended by November 2017.

4.1.1. Public attention at the national level

In this paper, institutional authenticated users were divided according to their identities into design units, construction units, suppliers, development units, government agencies, consulting agencies, research institutions, and magazines. The individual authenticated users were divided into the relevant personnel from the above-mentioned units. Among the institutional authenticated users, the top 3 user types in number were suppliers, consulting agencies, and development units; the user types with the most followers were government agencies, magazines, and development units. Among the individual authenticated users, the top 3 user types in number were the personnel from suppliers, consultants, and designers; the user types with the most followers were magazine editors, personnel from suppliers, and consultants. The details are shown in Fig. 3. We can see that in the field of green buildings, the number of suppliers and consulting agencies are larger. However, the public showed more attention to the policies released by government agencies and to explanations of concepts and the development status of green buildings by personnel from magazines.

4.1.2. Public attention at the regional level

Weibo authenticated users in the field of green buildings have shown a trend toward globalization, but are still mainly domestic users. Of the 956 users, 929 users are domestic, accounting for 98.43%. Of 925 mainland users, the eastern region had 656 users and the average number of their followers was 4450; the central region had 129 users and the average number of their followers was 1686; the western region had 99 users and the average number of their followers was 1560; and the northeast region had 41 users and the average number of their followers was 768. The user distribution and public attention toward green buildings were as follows: eastern region > central region > western region > northeast region.

4.2. Changing trends in public attention toward green buildings

In this paper, the sum of the number of collections, reposts, comments, and likes of a Weibo post was defined as the amount of attention the post received. The amount of attention on green buildings over a period of time was used to analyze changing trends in public attention toward green buildings.

4.2.1. Analysis of posts based on keywords search

In this paper, under the existing collection permission, the Weibo posts and the attention they received from February 2017 to November 2017 were obtained through the search and collection of data using the keyword “green building”; the Weibo posts and the attention they received from June 2013 to November 2017 were obtained through the search and collection of data using the keyword “ecological building”; the Weibo posts and the attention they received from February 2012 to November 2017 were obtained through the search and collection of data.
data using the keyword “low-carbon building”; the Weibo posts and the attention they received from September 2016 to November 2017 were obtained through the search and collection of data using the keyword “energy-saving building”. The details are shown in Fig. 4. The number of Weibo posts on the theme of green buildings was relatively small throughout the research period, <200 posts per month, and the amount of attention on these Weibo posts was not large, <3000 person-time per month. Although there were small fluctuations in the number of Weibo posts and the amount of attention on these Weibo posts during the research period, public attention toward green buildings was low.

4.2.2. Analysis of posts of a typical user

In order to solve the problem that the Sina Weibo posts did not include the above keywords, which suggests a small number of Weibo posts related to green buildings and less public attention toward green buildings, we selected the official Weibo account of the journal Eco-city and Green Building as a typical user and analyzed the number of posts and amount of attention on its posts from 2010 (its debut) to November 2017. Eco-city and Green Building is an academic journal sponsored by the School of Architecture, Tsinghua University and Tsinghua Urban Planning and Design Institute, and is officially approved by the Ministry of Housing and Urban-Rural Construction in China. This official Weibo account has 59,956 followers and has published 10,922 Weibo posts. The specific monthly number of posts and the amount of attention on its posts are shown in Fig. 5.

From Fig. 5 we can see that in May 2013 the number of the journal’s monthly Weibo posts increased significantly compared with that in the past, and then remained stable. The amount of attention on its posts showed different situations at different times: before March 2013, the amount of attention was low, and the monthly average amount of attention was less than 100 person-time. From March 2013 to April 2016, the average monthly amount of attention reached 438 person-time. From May 2016 to November 2017, the average monthly amount of attention rose to 1151 person-time. The report on government work of the annual sessions of National People’s Congress (NPC) and Chinese People’s Political Consultative Conference (CPPCC) in 2013 put forward that efforts should be made to strengthen the construction of ecological civilization and environmental protection. The 2016 report on government work of the annual sessions of NPC and CPPCC proposed that efforts should be made to strengthen environmental governance, promote new breakthroughs in green development, and resolve to find a win-win road between economic development and environmental improvement. The public attention toward green buildings increased with the change in government governance ideas, but the public attention on the posts was still not high relative to the 59,956 followers of the typical user.

The conclusions from 4.2.1 are consistent with those from 4.2.2. Furthermore, we found that the Chinese public’s attention toward green buildings enhanced significantly over the past years, but still needs to be improved.

4.3. Public sentiment toward green buildings

4.3.1. Popular posts selection

Among the Weibo posts collected, those about vertical greening houses received more comments. Vertical greening houses have good heat preservation and thermal insulation performance (Akinwolemiwa, Souza, Luca, & Gwilliam, 2018; Chiquet, Dover, & Mitchell, 2013), and are one of the representative types of green buildings. Therefore, we used the vertical greening houses as an example to analyze the Chinese public’s sentiment orientation and focus toward green buildings. Weibo users “Film Lover,” “Yangcheng Evening News,” and “Phoenix Satellite TV” released posts on the vertical forest building the Nanjing tower on February 8, 2017. The post by “Film Lover” had 161 reposts, 141 comments, and 328 likes; the post by “Yangcheng Evening News” had 76 reposts, 160 comments, and 198 likes; and the post by “Phoenix Satellite TV” had 241 reposts, 222 comments, and 263 likes. Aiming at foreign vertical greening houses, on August 4, 2017, the user “AC Architecture Creation” released a post on the Toronto tower. The post received 1159 reposts, 312 comments, and 2002 likes. The user “Hermann China Retail Micro-blog” released a post on “an ecological
building with a valley in the Netherlands’ on September 12, 2017, which received 500 reposts, 126 comments, and 1279 likes.

4.3.2. Sentiment analysis of comments of popular posts

(1) Sentiment orientation analysis

By integrating the comments of popular Weibo posts and conducting overall sentiment analysis, we concluded that the proportion of the public holding positive sentiments toward the vertical greening houses is 53.68%, and that of the public holding negative sentiments is 46.32%. Sentiment analyses of the comments of each Weibo post were conducted, and the results are shown in Table 1. We can see that the Weibo post released by the user “Film Lover” had slightly fewer comments of positive sentiment than negative sentiment, while for the other Weibo posts that released the same information, more than half of the comments were of positive sentiment. Moreover, there were more comments of positive sentiment than those of negative sentiment on Weibo posts released by the users “AC Architecture Creation” and “Hermann China Retail Micro-blog”. In the comments of negative sentiment, the comments with shock or disgust sentiments were in the majority, and those with an anger sentiment were zero. Therefore, the negative sentiment intensity was not high.

(2) Sentiment focus analysis

Word frequency analyses of the comments of negative sentiment in the 5 Weibo posts were conducted, and the results are presented in Table 2. Table 2 shows that the most frequently used word was not “price”, but “mosquito,” “insect,” “snake,” and “ant,” followed by “wind,” “sunshine,” “tree root,” “leaf,” and “fire.” Therefore, for vertical greening houses, the public was more sensitive to the change in life experiences, and considered the increase in mosquitos, insects, snakes and ants caused by the increased vegetation; they were also concerned about weakening daylighting and the potential safety hazard in severe weather conditions. The price was not the main cause of the negative sentiment of the public. Vertical greening houses are not common in the Mainland of China, but they have appeared in regions such as Shunde, Guangdong, China, with good operation and maintenance. We also observed that some of the public had negative sentiments toward vertical greening houses due to their lack of awareness of vertical greening houses.

5. Conclusion

Faced with the contradiction between the public’s increasing awareness of ecological and environmental protection and the slow development of the green building market, we explored the public’s attention status, changing trends, sentiment orientation, and focus toward green buildings in China. We collected and analyzed the information of Sina Weibo users and posts and comments of popular posts on the theme of green buildings. We utilized the Sina Weibo platform with web crawler technology, a text mining method, Octopus software, and the NLPIR big data analysis platform. The results showed that: the Chinese public paid most attention to institutional authenticated users such as government agencies and magazines, as well as individual authenticated users such as magazine editors; the attention toward green buildings in different regions in China varied: eastern region > central region > western region > northeast region. The Chinese public’s attention toward green buildings enhanced significantly with the change in government governance ideas, but still needs to be improved. Although vertical greening houses possess the characteristics of good heat preservation and thermal insulation, 46.32% of the Chinese public had negative sentiments toward vertical greening houses mainly due to worries about the increase in insects and snakes caused by the increased vegetation cover; price was not the main cause of negative sentiment. This paper revealed that the public has not paid much attention to green buildings under the background of China’s social and economic development; this is consistent with the conclusion that Chinese residents pay less attention to green buildings when buying houses (Li, Yan et al., 2014). This paper also revealed that some of the public had negative sentiments toward green buildings due to the lack of awareness of green buildings, which is in line with the results found by Hoffman and Henn (2008). The obstacles to the promotion of green buildings are no longer mainly technical and economic factors, but social and psychological factors. Thus, to further increase the public’s attention toward green buildings and improve the public’s sentiment toward green buildings, we present the following countermeasures and...
This paper studied the Chinese public’s attention and sentiment toward green buildings through Weibo user behaviors and collections, reposts, comments, and likes on Weibo posts related to green buildings. The results provide a reference for similar studies on public attitude toward new products and services.

This study had the following limitations: first, since Weibo users are mostly young people, the conclusions of this study may not fully represent the views of different age groups. Second, we studied the behaviors of Weibo users engaging with content related to green buildings, but we cannot rule out users without these behaviors do not pay attention to green buildings at all. Limited to the permission of information collection on the Sina Weibo platform, we only collected and analyzed relevant information of institutional and individual authentic users, and therefore the number of research samples should be enlarged in future studies.

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