

Chapter 5

Can Social Media Play a Role in Urban Planning? A Literature Review



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Abstract In recent years, the widespread use of social media has generated new and big datasets and provided new platforms for urban planning. However, existing studies have often been case-specific or focused on a specific planning domain, leaving the role of social media in urban planning generally questioned. This study conducts a systematic review of to which extent social media can be used in urban planning. There are two main findings. On the one hand, social media data have been increasingly used for urban analysis and modelling, often combined with conventional and new datasets. The domains of application include individual activity patterns, urban land use, transportation behavior, and landscape. On the other hand, social media have provided a new platform for participation, communication and collaboration. They provide new opportunities for cities to hear the voices of distinctive social groups, even those who do not formally participate in planning processes. In recent years, citizens have used social media to initiate and organize themselves collective actions in planning practices. Issues of using social media data in urban planning include population and spatial biases, privacy issues, and difficulties in extracting useful information out of the social media data. It is necessary to pay more attention to the proper dealing with these issues during the collection and methodological handling of social media data.

Keywords Social media · Urban planning · Data · Urban analysis · Participation

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1 Introduction

Social media have dramatically changed social relationships, offering opportunities for individuals to communicate and interact with a diverse group of people in global and local networks (Lewis et al. 2010). The “Web 2.0” features make social media enable information sharing, networking, and wider participation. Social media usage is growing due to the improvement of internet accessibility and an increase in smartphone users all over the world. As a result, a large number of volunteered data have been generated by users, including the posting of comments, observations, and the uploading of photos to social networking sites such as Facebook or Twitter (Kitchin 2014). These data often possess location information which can be valuable information for urban planning. They provide an addition to conventional data and can be used for urban analysis that leads to a real-time understanding of processes in urban space. Therefore, social media data can be considered as a resource for evidence-based decision making and strategic management in urban planning.

In recent years, scholars have increasingly debated on the role of social media in urban planning. Batty et al. (2012) argue that social media provide new and unconventional dataset for planning smart cities. They explore the way in which community networks can be generated through using social media data mined from mobile device data bases and websites, and how these data can be linked with data on housing and labor markets. Jendryke et al. (2017) argue that social media can provide information for understanding many urban topics, such as healthy issues, emergency locations, and social activity hotspots. Silva et al. (2014) indicate that social media data can be used for analyzing and clustering selected groups and activities in the city, which eventually makes it possible to characterize urban areas distinctively. The study of Kleinhans et al. (2015) shows that social media and mobile applications can increase public participation, engagement, and communication in urban planning. In practice, many local governments in Europe have actively participated in online conversations by using Facebook and Twitter (CIVITAS Policy Note 2015), while Chinese governments have used Chinese social media such as Weibo and WeChat to interact and communicate with citizens (Lin 2018).

However, existing studies have often been case-specific or focused on a specific planning domain, leaving the role of social media in urban planning generally questioned. To fill this gap, this study conducts a systematic review of the usefulness of social media in urban planning. It finds that social media data have been increasingly used for urban analysis and modelling in the domains of individual activity patterns, urban land uses, transportation behaviours, ecosystems, and landscapes. Besides, social media have provided a new platform for public participation, communication, and collective actions. With the widespread use of social media, citizens now easily establish large-scale online social networks and initiate collective actions themselves. More research is required to understand these emerging forms of bottom-up planning. However, this study also identifies several issues regarding the use of social media in urban planning, including population and spatial biases, privacy issues, and

difficulties in extracting useful information. It is necessary to deal with these issues during the collection and methodological handling of these social media data.

2 Social Media: Definition and Typology

According to Kaplan and Haenlein (2010, p. 61), “Social Media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content”. Web 2.0 refers to a collection of electronic, Web-based applications and technologies that facilitate interactive information sharing, user-centered design and collaboration. Kaplan and Haenlein (2010) further provide a classification of social media: collaborative projects (e.g., Wikipedia), content communities (e.g., YouTube, Flickr), social networking sites (e.g., Twitter and Facebook), blogs, and virtual social and game worlds.

Among them, social networking sites are applications that enable users to connect by creating personal information profiles, which include the information of photos, video, and blogs (Kaplan and Haenlein 2010). Users can invite friends and colleagues to have access to those profiles and send instant messages between each other. According to Statista (2018), the most popular social networking sites in the world include Facebook, Youtube, WhatsApp, Facebook Messenger, WeChat, Instagram, QQ, Qzone, Douyin, Sina Weibo and Twitter (Fig. 1). These leading social networking sites are usually available in multiple languages and enable users to connect with people across geographical borders. As the first social networking site, Facebook surpasses 1 billion registered accounts and currently have 2.23 billion monthly active users. About 2 billion internet users are using social networking sites and these figures are still expected to grow, with an increase in mobile device usage and mobile social networks. The 11th popular social networking site is Twitter on which users post and interact with messages known as “tweets”. The data of Twitter has been widely extracted and used in urban analysis.

3 Literature Review: Method and Resulting Corpus

The literature review performed consisted of three phases. Being aware of the multidisciplinary nature of the topic, the first phase sought to retrieve a broad set of papers. To achieve this aim, an advance search query was performed on the ISI Web of Knowledge, Scopus, ScienceDirect, and other databases. In each database, we entered the two key words “social media” and “urban planning” and searched for related papers. Besides, we collected relevant policy documents and other online materials about the topic. After reviewing all the received papers and documents, we selected 65 key papers related to social media and urban planning.

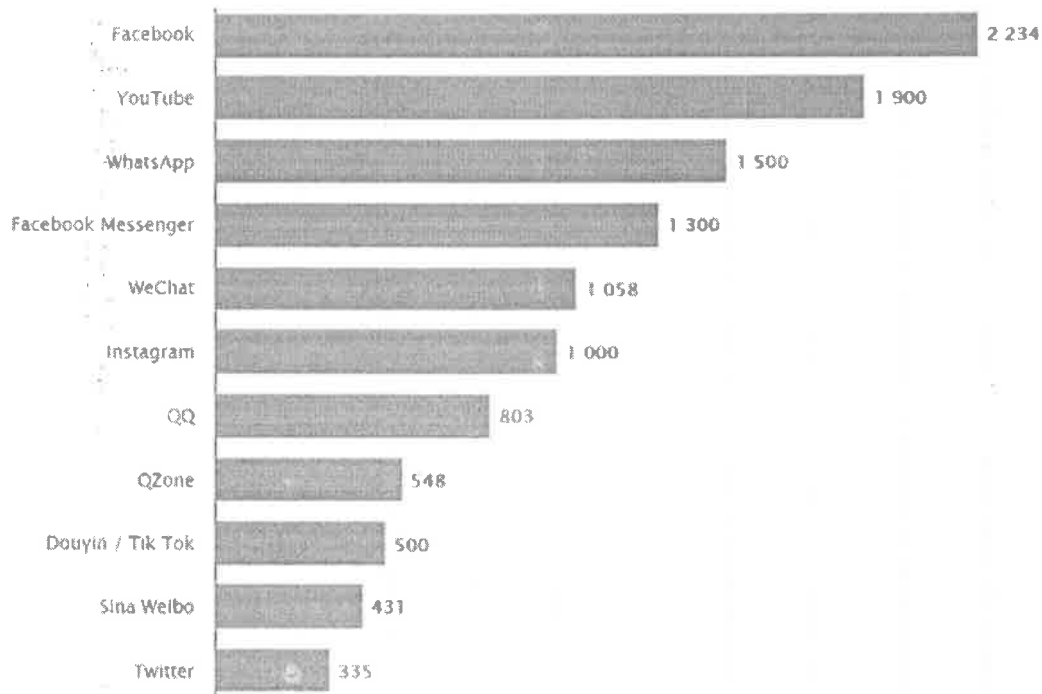


Fig. 1 Global social networking sites ranked by number of users in 2018 (in millions). <https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>

In the second phase, we imported the 65 articles into Nvivo for content analysis. Nvivo is a data analysis computer software package to analyze text documents and other resources. It allows users to classify and sort information, identify patterns, and examine relations in the data. We used the function of the word cloud to analyze the word frequency in all the papers. In Fig. 2, we show the most important terms: “social”, “media”, “data”, and “urban”. The other important terms include “information”, “new”, “city”, “planning”, “people”, “public”, “users”, “analysis” and “time”.

In the third phase, we looked in particular at how the mentioned key terms were used in the received papers. We identified two main ways of using social media in urban planning in the literature. On the one hand, social media data were used in urban modeling and analysis, in the domains of individual activity patterns, urban land uses, ecosystems and landscape. On the other hand, social media provided new platforms for public participation, communication, and citizens’ activism in planning practices. Most of the studies in this domain mainly focus on how social media is used as a tool in supporting participation and communication in planning processes, while some scholars have recently extracted social media data for analyzing information transmission and actor relationships. In the following sections, we firstly introduce the contents, characteristics, and types of social media data that can be used in urban planning. We then discuss the use of social media data in urban analysis and modelling in several planning domains. After that, we illustrate the application of social media



Fig. 2 The word cloud of the keywords of publications (*source* authors 2018)

data in participation, communication and citizens' activism. Finally, we discuss the opportunities and challenges of using social media in urban planning.

4 Social Media Data

Social media data contain valuable information such as geo-location, time, and texts of users. One feature of many social networking tools is that they allow users to create microblogs and post short contents such as comments, images and video (Lewis et al. 2010). Researchers analyze the content or the semantic meaning of a message text or a photo and use the geo-location of a message or a user for urban analysis. In most cases, data from social media platforms can be retrieved through their public APIs at low costs. "Any smart device or computer that is able to access the Twitter domain can enable a geo-coding facility that locates where the message is sent from and

there is considerable research into how social networks as well as spatial networks might be fashioned from such data” (Batty et al. 2012, p. 499).

Location-based services (LBS) in online social networks have provided an unprecedented amount of public-generated data on human movements and activities. They enable people to share their activity related choices (check-in) in their virtual social networks. Through location-based services, users can share their activity-locations when they visit restaurants, shopping malls, and so on (Rashidi et al. 2017). Thereby, the human activity pattern can be revealed from the “check in” information of places produced by users. While social media data is tremendously beneficial in modeling individual activity patterns, it is also greatly useful in inferring planning related variables such as urban land use characteristics (Zhan et al. 2014). For instance, Twitter and Flickr record the interactions between people and their surrounding environment, especially the information about the behaviors of people in geographic spaces. Geotagged Flickr photos possess a high suitability for exploring urban areas of interest, because they reflect the interest of people towards locations (Hu et al. 2015).

Previous research illustrates the broadness and depth of information that can be extracted from social media. Social media analytics make it possible to measure public sentiment and understand public opinions with real-time data mined from Twitter, blogs and other social media platforms (CIVITAS Policy Note 2015). Text analytics use natural language processing to spot key words and to gauge sentiment. Beside social networking sites such as Weibo can also show the followers and forwarding messages. This information can be extracted and used for analyzing the relations and communication of online participants (Zhao et al. 2018).

5 Urban Analysis and Modelling

5.1 *Individual Activity Pattern*

Social media check-in data, which contain users’ location information, have recently been used to understand individual activity patterns in urban spaces. Zhi et al. (2016) use the data from about 15 million social media check-in records during a year-long period in Shanghai to identify a series of latent spatio-temporal activity structures of the city. Using geotagged Twitter data, Shelton et al. (2015) analyze the everyday activity spaces of different groups of Louisvillians in the United States, reflecting that those neighborhoods were fluid and porous rather than rigid and static.

Nevertheless, social media data often lack the information of socioeconomic status of individuals and detailed spatial information. As a consequence, social media data are often combined with other datasets such as maps, images and other resources in urban analysis and modeling. For instance, Huang and Wong (2016) combine Twitter data with the American Community Survey (ACS) data to analyze the activity patterns of Twitter users with different socioeconomic status. Their research shows

that, while socioeconomic status is highly important, the urban spatial structure and the geographical layout of the region plays a critical role in affecting the variation in activity patterns between users from different communities. Jendryke et al. (2017) link social media data with remote sensing imagery to enhance contextual urban information. In their approach, remote sensing images are used to identify urban built-up areas and changes within those areas, while geocoded mobile social media messages deliver valuable information about human activity and the vitality found in these areas.

5.2 *Urban Land Use*

Social media data are used also to reflect urban land use. Tu et al. (2017) uncover urban functions by aggregating human activities inferred from mobile phone positioning and social media data. In their approach, the homes and workplaces of travelers are estimated from mobile phone positioning data to annotate the activities conducted at these locations. Chen et al. (2017) delineate urban functional areas based on building-level social media data. They assess the diversity of urban functions at the community level and identify several potential “central places” based on hot spot analysis. The analysis provides an alternative way of characterizing intra-city urban spatial structures and could inform future planning and policy evaluation.

Online point-of-interest (POI) data are also used to identify and estimate urban land uses. There are currently hundreds of voluntarily generated POI directories on the Web, such as Yahoo! and Facebook places. The POI data is a type of online volunteered geographic information, e.g., a specific point location that a considerable group of people find useful or interesting. Jiang et al. (2015) extract and classify the POI data from a user-content platform (i.e. Yahoo!) and combine these new data with census data, GIS data and proprietary business establishment data to disaggregate the aggregate data to a finer level (Fig. 3). They also use infoUSA POI data, which contains detailed information of business establishments in the United States, to evaluate this newly developed method. They find that the disaggregated employment estimations using these two different POI data sources are very similar. They argue that this new approach using POI data from social media provides opportunities for cities to estimate land use at high resolution with low cost while ensuring its quality with a certain accuracy threshold.

5.3 *Transportation*

There is a growing body of literature on the application of social media data on transport analysis and planning. To fully realize the idea of an urban mobility atlas for the smart city, there is a need to integrate increasingly richer sources of mobility data, including the data from public transportation, road sensors, surveys and official

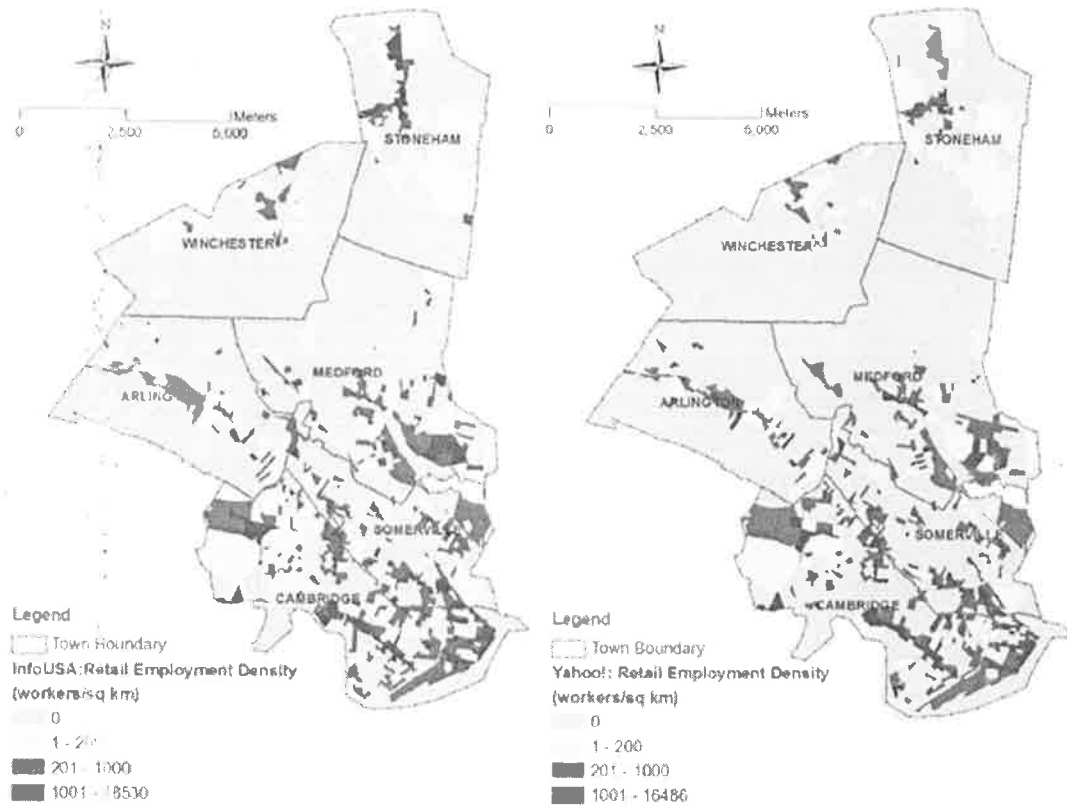


Fig. 3 Disaggregated retail employment density at block level, using infoUSA (left) POIs and Yahoo! (right) POIs (*source* Jiang et al. 2015)

statistics, participatory sensing and social media into coherently integrated databases (Batty et al. 2012). Rashidi et al. (2017) conduct an overview of transport related studies which used social media data for transportation planning and management. Their study reflects how social media data from different sources can be used to indirectly extract: (1) travel attributes, such as trip purpose, mode of transport, activity duration and destination choice, (2) land use variables, such as home, job and school location, and (3) socio-demographic attributes, such as gender, age and income. They argue that social media data have been used to develop models for estimating travel demand, managing operation, and long-term planning purpose. However, their research also finds that though the cost of obtaining social media data is low, processing such massive databases to extract travel information is a challenging task, especially for attributes such as trip purpose.

5.4 Ecosystem and Landscape

Social media data including geo-tagged photos are becoming an increasingly attractive source of information about ecosystem and landscape. Landscape photographs could tell us about the significance of human relationships with landscapes, human

practices in landscapes and landscape features. Oteros-Rozas et al. (2018) develop a methodological approach suitable for eliciting the importance of cultural ecosystem services and the landscape features underpinning their provision across five different countries in Europe. They perform a content analysis of 1404 photos uploaded in Flickr and Panoramio platforms that can reflect cultural ecosystem services. They find a positive though weak relationship between landscape diversity and cultural ecosystem services. Tieskens et al. (2018) use social media photos from Flickr and Panoramio to estimate the correlation between landscape attributes and landscape preferences in the Netherlands. They indicate that social media data can be incorporated as evidence of what elements of landscape are valued, where people are interacting with the landscape, and how these interactions characterize a landscape. Zhang and Zhou (2018) use social media check-in data in Beijing to develop multiple linear regressions to investigate how park attributes, locations, and contexts, and public transportation affect the number of park check-in visits. Their study shows that there are two effective measures for improving park use: (1) improving park accessibility through public transportation, and (2) planning small and accessible green spaces in residential areas.

6 Participation, Communication and Citizens' Activism

6.1 *Augmenting Public Participation*

According to CIVITAS Policy Note (2015), social media has a decisive role to play in motivating and empowering citizens, as well as in increasing engagement with the voluntary groups and NGOs. Many scholars argue that social media and mobile applications can increase public participation and community engagement in urban planning (Kleinhans et al. 2015). Citizens are now keen on using social media tools to interact with local governments in urban planning. The use of social media can reduce a top-down information dissemination channel and can open up citizens' activism. Furthermore, social media appeals to younger generations of citizens (Schroeter and Houghton 2011). Social media also provides opportunities for cities to hear the voice of social groups who do not formally participate in urban planning and decision processes. Therefore, Fredericks and Foth (2013) advocate the term of "augmenting public participation", i.e. capturing a wider audience of participants through the use of social media and web 2.0 applications. Social media provides a new way of supplementing traditional methods of public participation that are often face-to-face and engage small groups of participants.

Resch et al. (2016) argue that public participation in urban planning can acquire citizens' ideas and feedbacks in participatory sensing approaches like "People as Sensors". They indicate that citizen-centric planning can be achieved by analyzing Volunteered Geographic Information (VGI) data such as Twitter tweets and posts from other social media channels. They analyze tweets in three dimensions (space,

time, and linguistics), and use a graph-based semi-supervised learning algorithm to classify the data into discrete emotions. Their study shows that comments concerning problems of urban environments such as traffic jams and pollution can be detected in tweets. However, the limitations of using social media for participation are also identified by scholars. Kleinhans et al. (2015) argue that wider engagement only “materializes”, if virtual connections also manifest themselves in real space through concrete actions, by using both online and offline engagement tools.

6.2 Communication and Collaboration

As Castells (2009) observes, new communication mechanisms become the main source of signals leading to the construction of meaning in people’s minds, reframing power. He points out that “the communication process decisively mediates the way in which power relationships are constructed and challenged in every domain of social practice, including political practice”. Brkovic and Stetovic (2013) argue that social media provides opportunities for communication, community empowerment and collaboration. They indicate that social networking sites can be used to expand the outreach capabilities of governments and planners, and to broaden the abilities to interact with citizens, through sharing information, making announcements, asking and answering questions. For instance, in 2013 the Victorian government used Facebook, Twitter and YouTube to share ideas and engage citizens in a consultation process for the preparation of the new Metropolitan Planning Strategy for Melbourne (ibid). In China, the communication and interaction between governments and citizens has increased in recent years due to the development of smart cities (Lin 2018). Many city governments have used Weibo or WeChat to publicize information such as policies, plans, and regulations.

Social media can be used as a tool to support the interaction and collaboration between different groups of people who share a common interest (Sui and Goodchild 2011). Rice and Hancock (2018, p. 96) argue that “collaboration needs to include new forms of social participation (development of virtual networks and e-government tools) and social media by employing effective tools that facilitate citizen decision-making, thereby improving governance processes through empowerment”. They suggest that such a people-centered participatory and collaborative approach can promote sustainability and social equity.

6.3 Collective Actions and Citizens’ Activism

Social media has grown beyond the pure “social” realm and is now increasingly used to cause real impact including community activism (Foth et al. 2011). Social networking sites make it easy for citizens not only to maintain a number of weak ties, but also to create large-scale social networks that can perform powerful collective

actions (Gordon and Manosevitch 2011). Several cases have been identified in the literature regarding how citizens have used social media to initiate and organize collective actions in planning practices.

The case of Puerto Ayora in Ecuador illustrates that social media is an empowering tool for collective action claiming and proposing a better city (Pinzon 2013). Local residents used social media such as YouTube to oppose the construction of a suspiciously big building, communicate with planners and local authorities, and organize social protests. The collective action can be intersected with urban planning through semi-formal and mixed discursive spheres, driving the changes of urban planning from the traditional planning approach to the co-produced approach. Pinzon (2013) studies how social media, as a tool for collective organization and information sharing, affects the power relationships in urban transformation. She analyzes key driving factors including the social features of new technologies, the tensions between global and local implications of digital connectivity, the different ways how social media support social movements, and the limitations and challenges of digital tools.

The case of the installation of the new airport in Mexico City shows the role of Twitter in activist movements in urban planning (López-Ornelasa et al. 2017). They find that the knowledge of social media participation can be used to discover the wills of citizens and be a valid support for design, analysis and decision-making in urban planning. These new planning practices are thus characterized by citizens' activism, different from the communicative or consensus-building approach. It is important to critically evaluate the democratic potential of social media and recognize the potential power of local knowledge in shaping urban development (Pinzon 2013).

In China, social media have recently been used by citizens, civil society and experts to organize collective actions in planning practices. For instance, the residents in Shifang City of Sichuan Province used Weibo to organize a collective action against the local government's decision to build a molybdenum-copper plant (Cheng 2013). Although merely around 20 posts about the plan were publicized on the local government's Weibo, they were quickly read and forwarded by thousands of people. The people then gathered and were in conflict with the local police. As a consequence, the local government stopped the project permanently. Another case was that citizens and experts used Weibo to oppose local governments for the cancellation of the number 55 bus route in a planning practice in Shanghai (Zhao et al. 2018). Citizens and experts posted their comments and forwarded the information through the Chinese social media platform of Weibo, creating an open and decentralized network (Fig. 4). This bottom-up participation has led to the adjustment of the initial plan.

The mentioned emerging planning practices are related to "agonistic planning", which is a more radical action rather than consensus-seeking negotiations. The concept of "agonistic planning" entails that the planning process as a concrete activity supports the encounter between different conceptions of reality (Bäcklund and Mäntysalo 2010). For instance, the residents and local associations in the area of Vuores in Finland chose a more radical mode of influence involving the active use of social media outside the formal channels of planning participation (ibid). However, as an emerging field of urban planning this form of "agonistic planning" still lacks studies. More in general, with the increasing use of social media, citizens will have

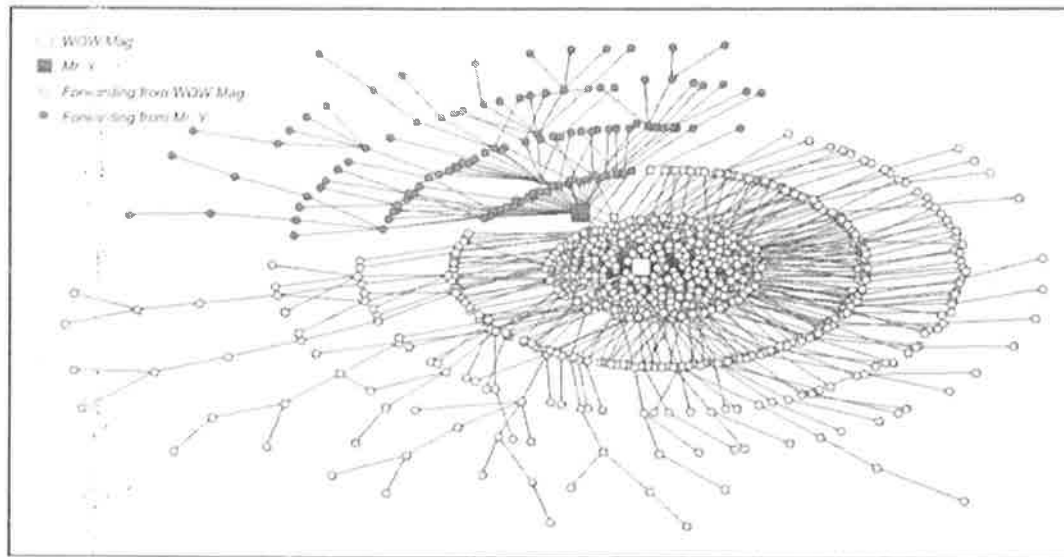


Fig. 4 Information transmission between online participants (*source* Zhao et al. 2018)

more opportunities to establish new networks and relationships and organize their own collective actions in urban planning, even outside the formal participatory planning processes. More research is required to understand the role of social media in bottom-up approaches and collective actions in planning practices.

7 Conclusion and Discussion

The literature review shows that social media is used in two main fields of urban planning (Fig. 5). On the one hand, social media data are extracted and used in urban analysis and modelling in the domains of individual activity patterns, urban land use, transportation and landscape. These data provide the information of geo-locations, time, texts, and photos of events happening. They are often combined with other conventional and new datasets and resources such as census data, GIS data, and remote sensing images for urban analysis and modelling. As pointed out by Batty et al. (2012), linking social media data with other datasets provides new and open sources of data essential to a better understanding how smart cities will function.

On the other hand, social media provides a new platform for citizen participation, communication, collaboration and citizens' activism. Local governments in many countries have increasingly used social media to communicate with citizens for urban policies, regulations and plans. With the rapid development of ICT, citizens have increasingly participated via websites etcetera about urban planning that affects their quality of life. Citizens can now easily initiate and organize themselves collective actions with the support of social media. In that, government is not in charge of the application of (social) media for participation, but the citizens themselves will decide upon the format, frequency, intensity, content, etcetera of their involvement in urban

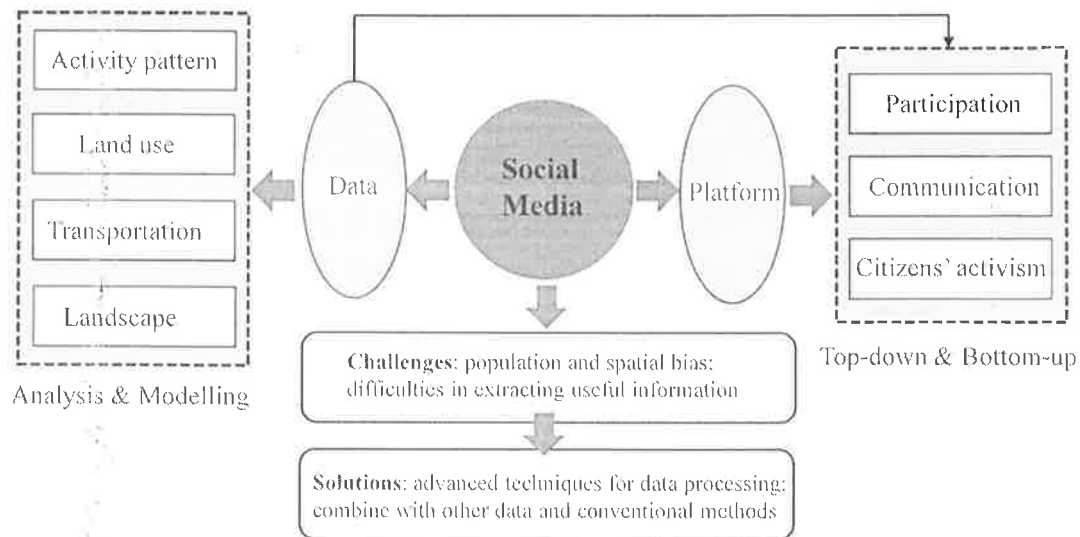


Fig. 5 The role of social media in urban planning (*source* authors 2018)

planning. These are emerging bottom-up forms of influencing urban planning, which are very different from conventionally participative or communicative planning that relies on rational communication of affected stakeholders (Bäcklund and Mäntysalo 2010). Participation through social media can also transcend the physical boundary of a local community and incorporate non-local actors into the discussion (Zhao et al. 2018). More attentions should be paid to the influence of social media on bottom-up participation and other emerging forms of citizen involvement in urban planning.

This study also shows several challenges associated with using social media in urban planning. First, substantial population biases exist across different social media platforms (Ruths and Pfeffer 2014). Social media is often used by young people, leading older generations and those lacking internet access out of important discussions. Second, there are inequalities of internet accessibility and social media usages in different countries, regions, cities and villages. As a consequence, spatial biases exist among different areas. For instance, the spatial distribution of social media check-in data is highly heterogeneous, i.e. data is mostly concentrated with big cities and small cities and rural areas have very few data (Zhan et al. 2014). Third, there are issues of privacy, since social media data contain the information of locations, texts and even photos of users. Any analysis conducted on personalized social media data requires careful attention to aggregate the geotagged information of people that is not identifiable (Rashidi et al. 2017). Attention should also pay to recent policies on data privacy and protection, such as General Data Protection Regulation in EU, and Information Technology Security of Personal Information Security Specifications in China. Fourth, the most challenging issue in front of using social media data pertains to complications associated with extracting useful information from the content of the data (Rashidi et al. 2017).

Several strategies can be applied to deal with the mentioned issues. Using social media in urban planning needs to be supplemented by other communication mech-

anisms in order to include people that are disconnected from digital networks. The limitations of social media lie within the flawed nature of social media data, so it is necessary to reduce biases during the collection and methodological handling (Jendryke et al. 2017). Comparing different networks or the same network at different times might mitigate these biases (Ruths and Pfeffer 2014). The users may not constitute a representative sample of the entire population, but social media data are generated by millions of people from different countries throughout the world (Hu et al. 2015). This bias is becoming less severe as social media users are growing, which will make the sample a close representative of the population. Furthermore, advanced text and data mining techniques, such as linguistic and text mining techniques, can be employed or developed to extract the useful information from social media data (Rashidi et al. 2017). Besides, the problems can be reduced by integrating social media data with other conventional and new datasets (Kovacs-Gyori et al. 2018). Finally, the government should support various forms of participation including bottom-up approaches and pay attention to emerging forms of agonistic planning. Different types of participation tools such as web-based planning support systems can be developed to support citizen participation and the cooperation of various online actors in the planning process (Lin and Geertman 2015). Conventional methods such as in-depth fieldwork and face-to-face meetings are still needed to understand the actual situation facing a group of citizens and communicate with affected stakeholders. With the widespread use of social media, it is expected that there will be an increasing impact on urban planning. More research is needed to explore this impact of the use of social media on urban planning. In that, it is also still necessary to pay more attention to the proper dealing with the mentioned issues during the collection and methodological handling of the social media data. Taken all that into consideration social media can change urban planning considerable.

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