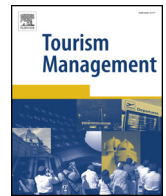




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Microclimate tourism and microclimate tourism security and safety in China

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ABSTRACT

This paper differs from conventional science and socially oriented studies of climate by integrating concepts derived from both approaches. Based on interdisciplinary, trans-disciplinary multidisciplinary literature review, it defines microclimate and its essences of including natural, social and interactive microclimate from tourism discipline context. For in-depth development of tourism in China under the pressure of tourism supply-side structure revolution, this paper proposes microclimate tourism and analyzes basic on-site microclimate tourism mechanism, basic tourists attractions supply mechanism, and dynamic flows and flexible organisation mechanism of microclimate tourism. For sustainable development, it explores tangible tourists attractions safety, tourists safety and industrial security of microclimate tourism as well as measurements and suggestions for mitigating relative security and safety issues.

1. Introduction

As a sub-regional or sub-local climate scale, microclimate refers to a small-scale space in specific locations, sites, streets, rooms and squares, among other spaces, and has mostly been researched in architecture and landscape design disciplines (Hou, Lu, & Fu, 2017) to explore the natural microclimate essences. Microclimate has also been utilised in tourist attractions and landscape creation, construction and management practices of the tourism industry (Greiser, Meineri, Luoto, Ehrlén, & Hylander, 2018), which also served to emphasise the natural aspect of microclimate. This research tradition of microclimate have rooted deeply in nature science definition of climate from disciplines of geography, climatology and meteorology (Craig & Feng, 2018; Olya & Alipour, 2015), which have ignored social and interactive microclimate essences (Becerra, Santaló, & Silva, 2013; Podoshen, Yan, Andrzejewski, Wallin, & Venkatesh, 2018) explored by social science from social climate perspective in particular environment (Finell et al., 2018; Shanker, Bhanugopan, van der Heijden, & Farrell, 2017). However, within tourism practices, it is obvious to notice that there are not only natural microclimate but also social microclimate and tourists participated interactive microclimate included in specific tourism products or services (Davis, 2016; Dimache, Wondirad, & Agyeiwaah, 2017; Durie, 2010; Ferdinand & Williams, 2013; Matheson & Finkel, 2013; Rihova, 2015), which have seldom been clearly proposed from a comprehensive microclimate perspective in tourism context. Although

contemporary China tourism practices consciously or unconsciously notice microclimate and microclimate tourism (Jiang, 2015; Li & Zhao, 2012; Lin, Chen, & Xu, 2013, pp. 59–64; Luo, 2016; Wu et al., 2014; Zhang, Li, & Zhang, 2014), it also lack of systematic definition of microclimate concept and exploration of microclimate tourism mechanisms. This situation inhibits the theoretical exploration and practical implication of microclimate in China tourism from comprehensive and creative microclimate tourism resources utilisation and microclimate tourism development perspective. Additionally, microclimate not only influence security and safety of tangible microclimate tourists attractions and tourists from natural microclimate perspective (Zhou, 2010; Zhang, Zhu, Wu, Zhang, & Pan, 2017; Liu, 2018; Litt & Audenaert, 2018) but also from social and interactive microclimate perspective (Botterill et al., 2013; Cró & Martins, 2017; de la Hoz-Correa, Muñoz-Leiva, & Bakucz, 2018; Lajos & Zoltán, 2014; Lanouar & Goaid, 2019; Park & Stokowski, 2009; Podoshen et al., 2018; Ryan, 1993), which often have been separately analysed in broad tourism security and safety perspective (De Urioste-Stone, Le, Scaccia, & Wilkins, 2016; Kapuściński & Richards, 2016; Meinel & Abegg, 2017; Mushtaq, 2018; Olya & Al-ansi, 2018; Winter 2008) rather than comprehensively defined and analysed in microclimate tourism context. This will impede comprehensive microclimate tourism security and safety research in the long term and hamper sustainable development of microclimate tourism without guarantee of integrated microclimate tourism security and safety system.

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Therefore, this study defines comprehensive concepts of climate and microclimate from the tourism discipline perspective on the basis of systematic literature reviews. It proposes microclimate tourism as creative development pattern in China tourism market and analyses basic on-site mechanism, basic tourists attractions supply mechanism, and dynamic flow and flexible organisation mechanism of microclimate tourism. Considering sustainable development of microclimate tourism, it systematic analyses tangible tourists attractions security and safety influenced by natural microclimate, tourists security and safety influenced by social and interactive microclimate, and industrial microclimate tourism security and safety influenced by the whole microclimate tourism industry. For mitigating microclimate tourism security and safety, it also analyses relative measures and suggestions for specific security and safety issues. This paper firstly proposes comprehensively microclimate concept in tourism context from interdisciplinary, trans-disciplinary and multidisciplinary perspectives and sheds light on microclimate tourism as creative development pattern in China, which will become creative model and pattern of tourism supply under pressure of supply-side structure revolution in contemporary China tourism industry (Cheng & Wang, 2016; Hao, 2017; Jiang, Zhu, & Zhu, 2017). It encourages tourism suppliers to utilise natural, social and tourists-participated interactive microclimate as integrated microclimate tourism resources to create particular microclimate tourism products and services for tourists, which enlarges tourism resources domain as well as its dynamic and creative combination in microclimate tourism context. It defines theoretically and practically integration and cooperation of multidisciplinary advantages in microclimate tourism and microclimate tourism security and safety in tourism context, which will strengthen innovation potential of microclimate tourism in China.

2. Methodology

Based on different types of literature reviews summarized by Briner and Denyer (2012), this paper combines meta-analytic review method, expert thematic or argument based review method and systematic review method together to analyse and synthesises climate, microclimate and microclimate tourism concept, to explores microclimate tourism mechanisms, and to summarizes microclimate tourism security and safety as well as relative measures and suggestions. China Knowledge Resource Integrated Database (CNKID) (www.cnki.net) is the most powerful China academic engine to search both Chinese and foreign academic publications, which integrates journal papers, conference proceedings, degree theses, newspaper articles and books into database searching process and protocol. As for foreign academic publications searching services provided by CNKID, it includes journal literature titles data from more than 50 famous international publishers such as Springer, Taylor & Francis, John Wiley & Sons, Wolters Kluwer, ProQuest, PubMed, and J-STAGE etc., and it almost covers 90% journals within SCI, SSCI and EI Index Lists, which all together accounts for more than 50 million articles that could be searched from keywords, titles, authors, DOI, or their combinations. The data of foreign academic publications collected in CNKID starts early from 1840 until now while the Taylor & Francis journal database starts later from 1904 to now. Considering all merits mentioned above, the CNKID has been chose for this paper's literature review database.

CNKID was searched in this study for Chinese and foreign researches of climate, social climate, microclimate, tourism security and safety, and climate security and safety through entering Chinese terms of “qi hou”, “she hui fen wei or she hui qi hou”, “wei qi hou”, “lv you an qua” and “qi hou an quan” into keywords, title and subject as searching condition from 01/01/1936 to 10/08/2018 in CNKID (<http://kns.cnki.net/kns/brief/result.aspx?dbprefix=SCDB>); and the search terms of “climate”, “social climate”, “microclimate”, “tourism security and safety” and “climate security and safety” was entered into keywords, title and subject for searching respective foreign researches in CNKID

(<http://kns.cnki.net/kns/brief/result.aspx?dbprefix=WWJD>) from 01/01/1843 to 10/08/2018. A total of 32,642 climate researches, 242 social climate researches, 922 microclimate researches, 66 climate security and safety researches and 998 tourism security and safety researches were collected. This total data-set was then re-organized on Excel recording publications trends and disciplines distributions details. Meanwhile, the keywords co-occurrence networks naturally generated by means of visualization analysis function of CNKID. It should be noticed that not all the literature published in 2018 were collected, and the study only covers the period to August 10th, 2018.

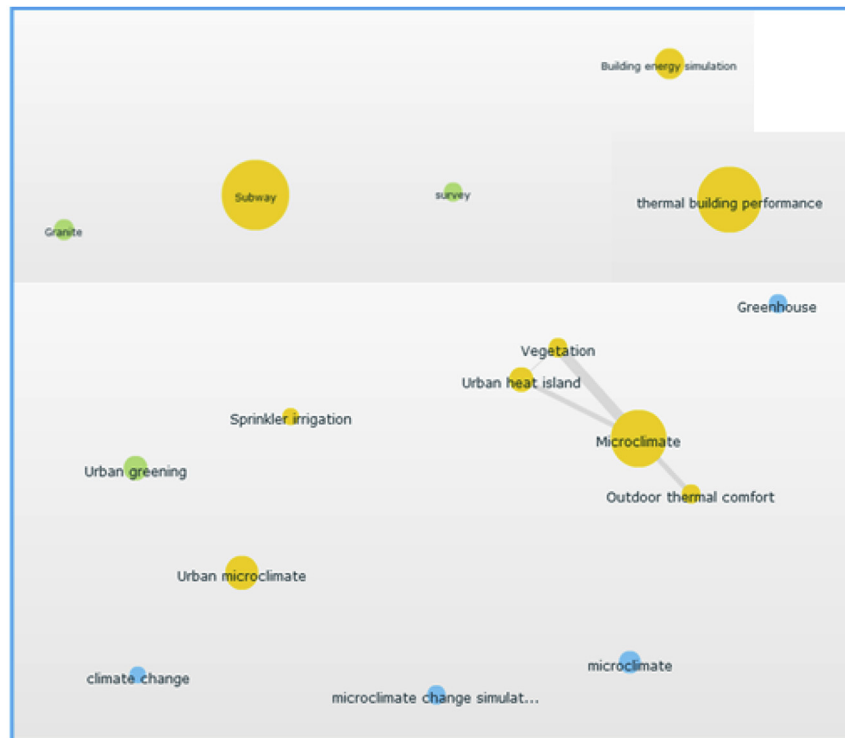
3. Microclimate, microclimate tourism and microclimate tourism mechanisms

3.1. The concept of microclimate is well established within the natural and social sciences

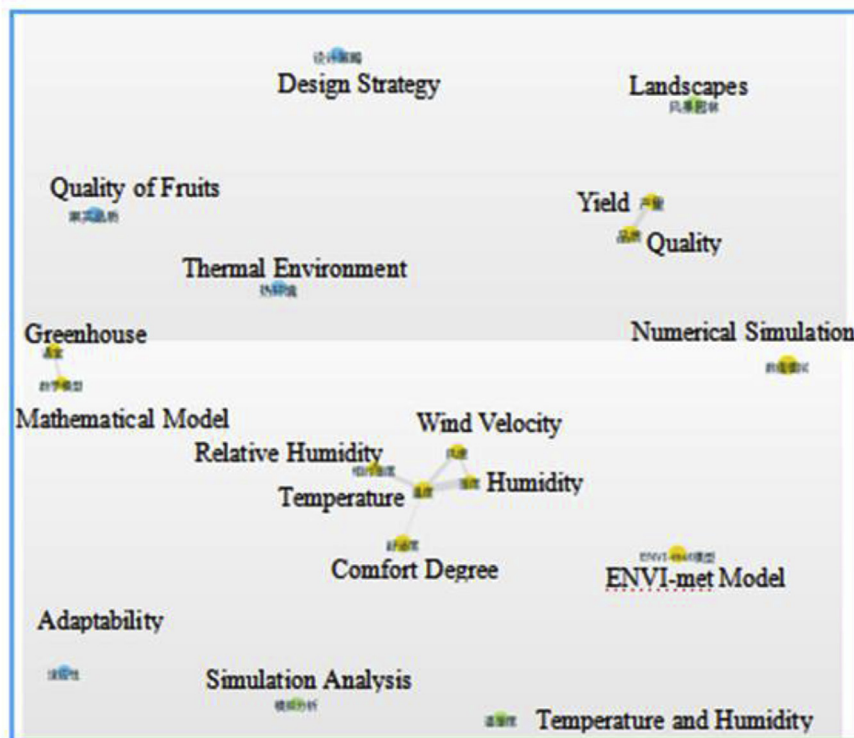
3.1.1. Microclimate concept in natural science

Traditionally, climate is part of the natural environment that had been recognized, explored and utilised by natural science long ago. The number of climate studies in CNKID mainly distributed in natural science disciplines, such as meteorology, biology, environmental science and resource utilisation, geology and so forth. Additionally, from the keyword co-occurrence networks of climate studies in CNKID, the keywords ‘climate change’, ‘adaptation’, ‘climate variability’, ‘uncertainty’ and other natural climate features appeared frequently. Therefore, contemporary climate studies focused more on climate from natural science discipline perspectives, which have been profoundly influenced by natural climate concepts generated from climatology. Climatology, as a sub-discipline of atmosphere science and physical geography (Bryant, 1986b), actively focuses on climate characteristics, formation and evolution, as well as the interaction relationships between climate and human beings, who define climate as the average weather over a long period (classical period is 30 years) (Alados-Arboledas, 1986; American Meteorological Society, 2018; Bryant, 1986a, pp. 172–188). However, most natural science disciplines focus on the natural and scientific climate aspects to determine, for example, what natural climate is, why it performs in particular patterns and how climate interacts with the human society. Therefore, the essence of natural climate emphasizes the natural interactions among climate elements in a specific environment, such as temperature, precipitation, wind and humidity.

Depending on the climate research scale, climatology, physical geography and meteorology clearly define global climate referring to earth scale, regional climate referring to geographical homogeneous areas, and local climate referring to small limited areas, e.g. forest, city, rural and mountain (Hartmann, 2016, pp. 1–23; Whitbeck, Oetter, Perry, & Fyles, 2016). Comparatively, microclimate refers to a small location scale, such as street corners, square, room and corner of specific landscapes, and often focuses on indoor and outdoor locations in sub-region areas (Camuffo, 2014). Based on the Chinese and foreign studies of microclimate in CNKID, disciplines of building science and engineering, basic science of agriculture, meteorology, biology, gardening and forestry actively participated in microclimate studies (Fig. 1: A, B). More precisely, architecture (vital microclimate research domain) microclimate of urban, city community (Wong, Hart, & Lai, 2016), commercial street (Hou et al., 2017), street canyon (Ai & Mak, 2015), building (Du, Bokel, & Dobbelsteen, 2014) and square (Lenzholzer & Koh, 2010) areas have been explored frequently. Other disciplines have also investigated microclimate, such as crop (Bouhoun Ali, Bourmet, Cannavo, & Chantoiseau, 2018) and grape cluster microclimate (Martin et al., 2016) in agriculture; cave microclimate (Boyles, Boyles, Dunlap, Johnson, & Brack, 2017) for bat and tree cavities; nest-box microclimate (Maziarz, Broughton, & Wesołowski, 2017) for hole-nesting birds in zoology; aircraft (Ganther et al., 2017), vehicle and subway tunnel microclimate (Qiao, Xiu, Zheng, Yang, & Wang, 2015) in



A: Keyword co-occurrence network of foreign countries microclimate tourism studies



B: Keyword co-occurrence network of China microclimate tourism studies

Fig. 2. Microclimate studies of China and Foreign countries in CNKID from different disciplines.

microclimate, which could be summarized by keywords and keywords co-occurrence networks (Fig. 2: A, B).

3.1.2. Microclimate concept in social science

From the social science perspectives, climate has also been used to

describe comprehensive social environment features that are organized, constructed and created by human beings or organisations, which also refer to social climate or atmosphere. According to CNKID social climate research data set, disciplines of educational theory and management and psychology mainly explore social microclimate in school,

classrooms (Finell et al., 2018; Joe, Hiver, & Al-Hoorie, 2017), ward or hospital (Doyle, Quayle, & Newman, 2017) in foreign countries than in China, as well as some social climate of e-commerce (Ruiz-Mafe, Bigne-Alcañiz, Sanz-Blas, & Tronch, 2018) and organisations (Erdil & Ertosun, 2011). Because disciplines of ideological and political education, the Communist Party of China, ancient Chinese history and China and international politics have more interests in social microclimate research in China, which focus more on social climates of economy, politics and culture (Bonaparte, Kumar, & Page, 2017; Ohotina & Lavrinenko, 2015). Among those researches, social climate emphasises social information in symbolic, tangible or intangible forms, which could become information sources for human beings no matter they are consciously or unconsciously developed or conveyed. After obtaining information, human beings tend to consume information to rational or emotional think, to make decisions, to take some actions or to behave, that is to mentally or behaviorally interact with society. Following this dynamic development and evolution mechanisms, social climate also focus on various interactions and interactions patterns such as interactions for fulfilling particular social functions (education, trade, medical care or entertainment etc.) (Doyle et al., 2017; Finell et al., 2018; Ruiz-Mafe et al., 2018). Within some constructed social climate there also will generate or evolve new social climate, which embrace dynamic and diverse social interaction essences. In brief, social climate emphasises the dynamic social interaction essences of the human society to create, construct or manage particular social and cultural climates consciously or unconsciously through social symbolic, tangible or intangible information exchanges and interactions among human beings and diverse social organisations.

When it comes to small scale social climate, social microclimate have been practically utilised in particular locations and space of society where have been consciously or unconsciously constructed, created, arranged or managed by human beings influenced internally or externally by various information in society. For instance, various and diverse retail and sale stores (Koschmann & Isaac, 2018) in particular society have been established, decorated and organized for specific social microclimate such as stores of clothes (Fontana & Miranda, 2016), flowers (Peters & Bodkin, 2018), jewelry (Sanguanpiyapan & Jasper, 2010), books (Li, 2017) or supermarket (de Wijk, Maaskant, Kremer, Holthuysen, & Stijnen, 2018) etc.; different places provided services such as kindergarten (Meng, 2018), gyms (Ji & Cao, 2007), dance halls (Veal, 2017), clubs or bars (Nisar, Prabhakar, & Patil, 2018) etc.; and places produced tangible or intangible products like factories or institutions etc.. Hence, social microclimate have appeared everywhere in society practices while lack of conceptualization and theoreticallization so that the concept of social microclimate have not been clearly proposed before, which have tremendous and profound development vitality in human society all the time.

3.1.3. Comprehensive microclimate concept from tourism discipline perspective

For the interdisciplinary, trans-disciplinary and multidisciplinary characteristics and a broad view of resource, microclimate in the tourism discipline not only embraces natural (Førland et al., 2013; Laws, 2011) and social essences (Altinay, Sigala, & Waligo, 2016; MacNeill & Wozniak, 2018) but also emphasises the harmonious interactions among natural microclimate, social microclimate and tourists participated interactive microclimate (Woosnam, Shafer, Scott, & Timothy, 2015; Yürük, Akyol, & Şimşek, 2017). Practically, tourism practices have occurred and organized in particular locations and spaces, where large as destinations of cities, counties, villages or small as streets, squares, parks, rivers and so forth. Thus, natural microclimate, social microclimate and interactive microclimate have integratively embedded into each locations provided for tourists. For instance, microclimate of seaside (Durie, 2010; Owen, 1990), mountains (Fidgeon, 2008; Varley & Medway, 2010) and high-latitude regions (Denstadli, Jacobsen, & Lohmann, 2011) have attracted tourists

to experience cool natural microclimate (low temperature, comfortable wind, fresh air etc.) and social microclimate of seaside or mountains constructed through tangible and intangible symbolic information, and then to co-create interactive microclimate through tourists' integration into and interactions with natural and social microclimate. Meanwhile, specific social microclimate in different tourism fields also attract tourist attentions and become popular tourist attractions. For example, diverse cultural festivals appeal to and allow tourists to participate actively in festival processes, thus gaining physical, psychological and mental experiences (Davis, 2016, 2017; Ferdinand & Williams, 2013). Theme parks (Bigné, Andreu, & Gnoth, 2005; Hunter, 2014), hotels (Han, 2013; Lai & Hitchcock, 2017), historical streets (Wang, Yu, Lin, & Jia, 2015), restaurants (Erkuş-Öztürk & Terhorst, 2016; Nakayama & Wan, 2018), souvenir shops (Li & Ryan, 2018) and casinos (Kim & Kang, 2018) in the contexts of particular societies also become pivotal tourists attractions through providing special or exceptional microclimate for tourists by means of internal and external landscape design, social and cultural human interaction pattern management, creative and harmonious organisation different microclimate into the whole tourism experience process.

Additionally, although comparative advantages of natural and social microclimate in specific tourist attractions account for different proportions, the harmonious interactions between these microclimate are indispensable in successfully and sustainably designing, planning, marketing and managing tourist attractions and destinations. For example, natural, social and interactive microclimate in museums (Dimache et al., 2017), community-building-based tourism activities (Ruiz-Ballesteros & Cáceres-Feria, 2016), rural villages (Gao & Wu, 2017) and heritage sites (Rasoolimanesh, Ringle, Jaafar, & Ramayah, 2017) have become microclimate tourists attractions (Benur & Bramwell, 2015; Sainaghi & Baggio, 2017). Meanwhile, the active presentation approach after experiencing natural and social microclimate in tourists attraction sites creates interactive social microclimate to satisfy tourists (Jensen, Li, & Uysal, 2017). The reflective engagement of zoo visitors (Ballantyne, Hughes, Lee, Packer, & Sneddon, 2018), site physical settings and vandalism behaviour of tourists and local residents (Bhati & Pearce, 2017), happy destination and tourist interactions (Chen & Li, 2018) and destination fascination development and management (Liu et al., 2017) have clearly uncovered the tourists participated interactive microclimate formation mechanisms when tourists have experienced particular natural and social microclimate. Therefore, microclimate in the tourism discipline absorbs the natural and social microclimate essences and includes active tourist engagements and interactions in specific tourism products and services through interactive microclimate co-creation mechanisms.

3.2. Microclimate tourism generated and developed in China tourism market

3.2.1. Microclimate tourism in China tourism market

In China context, up soaring microclimate-related preferences and demands of tourists in China tourism market (China Tourism Academy, 2018, pp. 27–28) have sparked microclimate tourism products and services development and upgradation. For instance, traditional cool or warmer microclimate tourism products and services in summer holidays (Peng, 2018; Yang & Zhang, 2016) or winter holidays (Chen, 2015) have appeared more diversity through natural, social and microclimate tourism resources optimal distribution, which also have triggered summer and winter tourism industry development supported by local government (Li, 2011; Zhou, Zhang, Gao, & Tang, 2017). Microclimate products and services of wellness (Cao & Deng, 2016; Li, 2012), bird-seeing (Cheng, Wang, He, & Ma, 2013; Li, Guan, & Wu, 2018), flowers and color leaves watching (He, 2014; Zhu & Zhang, 2017), snow and rime watching (Wu, 2014) have developed profoundly through harmonious utilizing microclimate tourism resources. Moreover, festival and cultural microclimate tourism products and services

have enriched and creatively flourished in China through absorbing local culture essences that have diverse microclimate characteristics and interaction patterns, such as music festivals (Chen, 2012; Liu, 2014) especially some minorities music festivals (Ji, 2014; Zhang, 2018), microclimate folk customs festivals (Zhang, Jiang, & Gong, 2016), microclimate food festivals (Zhang, 2008) and so on.

The interactions between supply and demand of microclimate tourism products and services in China tourism market also have been accelerated by smartization of tourists and microclimate products and services providers through taking technological advantages of contemporary China society. For example, smart mobile phones owned by tourists have not only been popularized but also constantly upgraded from one generation to another with more creative and accurate information communication patterns and various mobile phone applications APP (Chen, Yao, & Lian, 2016; Zhang & Yang, 2018; Zheng, Deng, Wei, & Chen, 2017, pp. 64–66; Zheng & Zhang, 2018). Consequently, tourists could obtain various and diverse natural, social and interactive microclimate of particular microclimate tourists attractions or tourists destinations, which have influenced tourists' microclimate preferences, choices, decisions of consuming microclimate products and services as well as have promoted specific and attractive microclimate creation and organisation for tourists. There are irreversible trends of contemporary China tourism market that could be summarized as follow: more accuratization of various microclimate information both for tourists and supplier; more customization of microclimate tourism products and services for tourists provided by supplier that supported by big data technology; more diversification of demand and supply of microclimate tourism products and services promoted by integration development of tourism with meteorology, culture, technology in China (Chen & Wei, 2018; Ji, 2017; Tang, Peng, Luo, & Tao, 2017; Zhang, 2015; Zhao, 2016). Therefore, microclimate tourism have been practically developed and creatively upgraded in China tourism market while lack of conceptual and theoretical development in contemporary China academic researches.

3.2.2. Microclimate tourism and its essences

The supply side transformation and supply structure revolution of China tourism market have gained high attentions from government, tourism practitioners, academic researchers and tourists, which calls for creative and in-depth transformation and structure revolution of tourism supply for satisfying up soaring tourism demand in China and optimizing tourism resources distribution in tourism market (Wang, 2016, p. 2; Xing, 2017). Under this background and the practices of microclimate tourism in China, this study proposes microclimate tourism as an essential tourism development, organisation and management pattern in Chin context from the interdisciplinary, multi-disciplinary and trans-disciplinary perspectives. Microclimate tourism emphasizes natural, social and interactive microclimate as microclimate tourism resources; evokes comprehensive, integrative and creative microclimate tourism products and services production, organisation and management with the help of smartization both supply and demand side of tourism market; triggers conceptual and theoretical exploration of microclimate tourism and microclimate tourism mechanisms for supporting constantly and sustainability development of microclimate tourism practices in China; and opens a systematical integration era of tourism with other tangible and intangible resources of China society through harmoniously integrating natural and social science into microclimate tourism researches and practices. Therefore, the propose and development of microclimate tourism in China have rooted deeply in contemporary reality and future development tendency of China tourism industry.

Microclimate tourism is the specific and operative segment of climate tourism in particular context, which could promote microclimate tourism resources distributions, creatively facilitate new generation, diverse creation, harmonious construction, flexible organisation and dynamic management of more locally microclimate tourism resources,

and profoundly enrich tourism market supply for satisfying tourists demands. Microclimate tourism not just focus on one specific types of tourist with relatively stable tourism preferences and demand but embrace diverse tourists for each type of tourist prefer specific microclimate and then different types of tourist will create large microclimate tourism market with diverse market segments according to the Long Tail Effect (Huan, Beaman, Chang, & Hsu, 2008; Pan & Li, 2011). The supply side will focus on the microclimate creation, construction, organisation and management for tourists whereas the demand side will concentrate on obtaining and consuming microclimate experience and interactions. Naturally, microclimate tourism have obtained development opportunity in contemporary society of China, which calls for more individualization, diversification and integration of tourism products and services supply, more flexible organisation and management of microclimate tourism activities, and more advancement of natural, social and interactive microclimate integration for enriching in-depth tourists experience. Therefore, microclimate tourism attracts tourists to consume and experience particular microclimate tourism products and services provided by suppliers through utilizing natural, social and interactive microclimate tourism resources, which will promote China tourism supply-side transformation and revolution as well as enlarge China tourism integration development domains.

3.3. Microclimate tourism mechanisms

3.3.1. Basic mechanism of on-site microclimate tourism

In particular provision site of microclimate tourism products and services, microclimate (natural and social) have been provided for tourists through comprehensively exploring natural and social microclimate tourism resources and their harmonious interactions as pivotal input into specific microclimate tourism products or services (Fig. 3: ①,②). Tourists perceive temperature, wind, humidity, thermal radiation and air fresh degree of the natural microclimate through natural microclimate information sources (Fig. 3: ③) and permeate into things (landscapes, streets, heritage sites, hotels, restaurants, bus stations etc.) or events (human behaviors of groups of people or individuals) to perceive particular social microclimate through tangible or intangible social microclimate information sources (Fig. 3: ④). Moreover, natural and social microclimate as a whole have been provided as microclimate tourism products or services for tourists also consider natural microclimate will physically, psychologically or mentally influence tourists (Fig. 3: ⑤) then to impact tourists' perception of social microclimate around them (Fig. 3: ⑥). Meanwhile, social microclimate also will psychologically affect tourists (Fig. 3: ⑦) then further influence their perception of natural microclimate (Fig. 3: ⑧).

Apart from providing only natural or social microclimate for tourists as products and services, microclimate tourism also focus on tourists participated interactive microclimate as pivotal and co-created parts of microclimate tourism products and service, which point out essences of tourism of randomly re-organizing human being for searching meaning and happiness of life (Fig. 4). The accumulated effect of tourists participated interactive microclimate will further influence tourists' interpretation or reinterpretation of particular natural microclimate (Fig. 4: ①→②) and social microclimate (Fig. 4: ①→③) through involving themselves into meaning reconstruction of particular microclimate tourism sites. Meanwhile, the accumulated effect of tourists participated interactive microclimate will directly or indirectly impact natural microclimate in accumulative CO₂ emission and behavioral protection or destruction on natural environment (Fig. 4: ①→②); it also will adjust social microclimate of particular microclimate tourism products or services by means of accumulative effects of tourists' behaviour preferences, demands tendency, and dynamic changes rules (Fig. 4: ①→③). Collectively natural microclimate and social microclimate provided by suppliers (Fig. 4: ④) also will facilitate or catalyze the formation of tourists participated interactive microclimate (Fig. 4: ④→⑤), which could also be previously designed or arranged by providers as essential

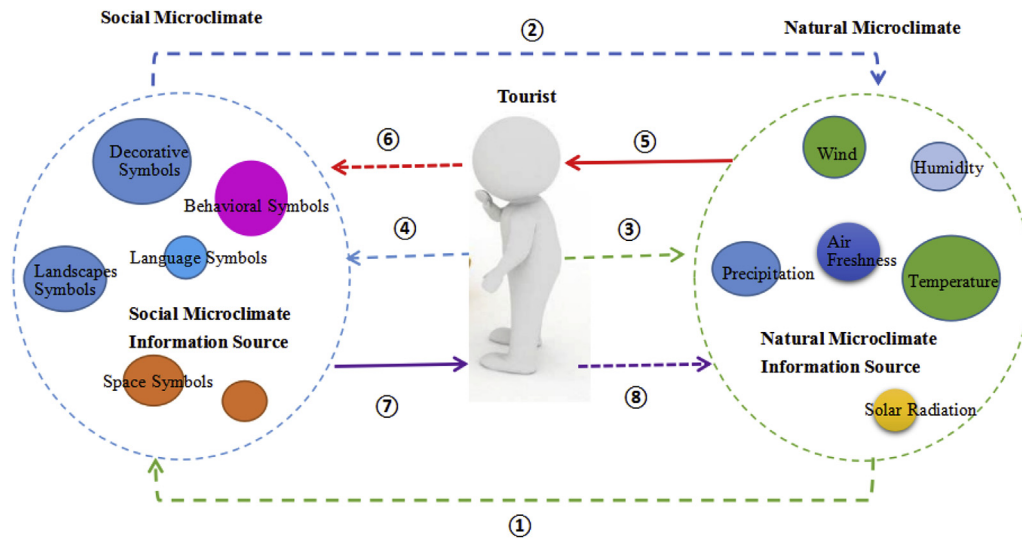


Fig. 3. Basic mechanisms of on-site microclimate tourism with one tourist.

tourists attractions of microclimate tourism. Microclimate (natural, social or interactive) as tourism resources could be utilised singly or in diverse combinations to create particular microclimate tourism products or services emphasizing single microclimate or creative microclimate combinations, which depends on tourists preferences and demand, microclimate tourism providers' production abilities and efficiency. Hence, the basic mechanism of on-site microclimate tourism is pivotal to understand the basic elements and essences of microclimate tourism. Nevertheless, the practical world is still considerably simple to reflect without considering the following questions: Who designs, creates, constructs or provides the whole microclimate tourism products or services? How and why do they design, create, construct or provide such products or services? What mechanism has appeared in

this process?

3.3.2. Basic tourists attractions supply mechanism of microclimate tourism

Before the complicated and interactive mechanisms of the supply side of microclimate tourism are analysed, examining how basic tourist attractions of microclimate tourism have been provided by suppliers is necessary when considering a simple mechanism of one provider model (Fig. 4). Based on local natural and social climate, providers also have been influenced by various natural and social information of tourism industry, climate tourism and microclimate tourism development tendency, which will determine their provision of particular microclimate tourism products or services as tourists attractions. For the tourist attraction supply, the providers select a particular natural, social and

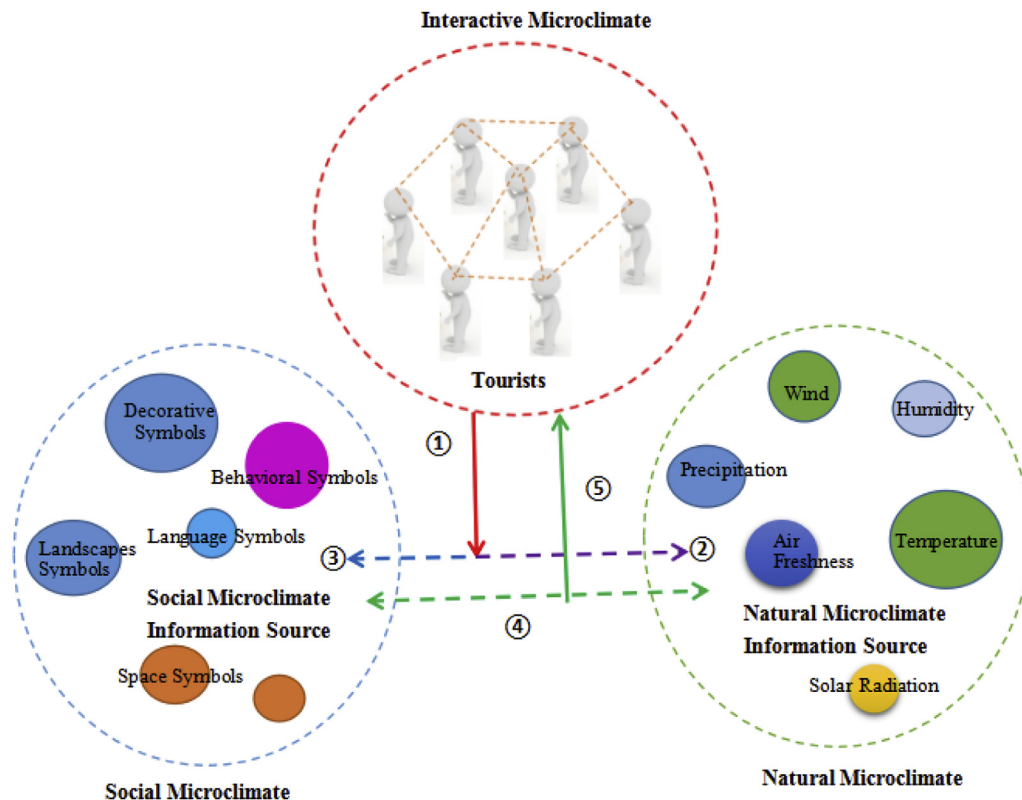


Fig. 4. Basic mechanisms of on-site microclimate tourism with more tourists.

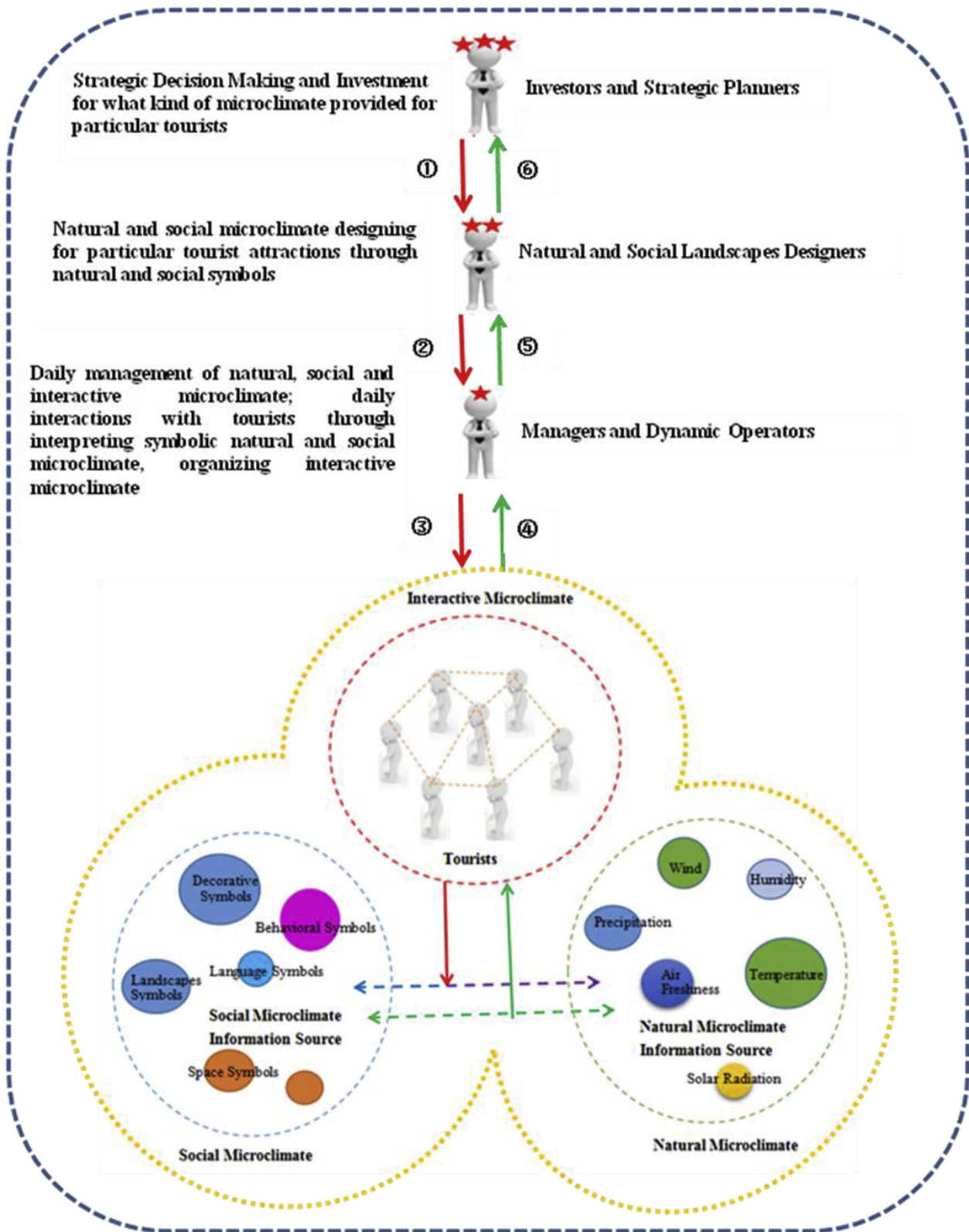


Fig. 5. Basic tourists attractions supply mechanism of microclimate tourism.

interactive microclimate to plan, design, construct, organise and manage to attract particular tourists and position in the segmental microclimate tourism market (Rihova, 2015; Nickerson, Jorgenson, & Boley, 2016; Yang, Khoo-Lattimore, & Arcodia, 2017). To supply particular tourist attractions effectively and sustainably in microclimate tourism, the investor and strategic planner as upper-level leaders

actively obtain various natural and social information of society to determine the supply direction in the microclimate tourism market (Hewlett & Brown, 2018; Mai & Smith, 2018). Then, their strategic decision making for what type of microclimate will be provided for particular tourists and the dynamic adjustment and management are determined in accordance with natural and social microclimate changes

influenced by dynamic changing of regional environment (Lin & Matzarakis, 2011; Talón-Ballester, González-Serrano, Soguero-Ruiz, Muñoz-Romero, & Rojo-Álvarez, 2018). The natural and social landscapes designers, being in the middle layer, acquire directional microclimate design information from the investors and strategic planners and then actively interpret it into operational and symbolic microclimate designing schemes through frequent and constant negotiating with investors and strategic planners (Fig. 5: ①→⑥; ⑥→①). The landscape designers also depend on their particular internal knowledge designing system and the external climate to determine what kind of natural and social symbols as information sources could be utilised to design microclimate tourists attractions (Liao & Zheng, 2018; Packer, Ballantyne, & Hughes, 2014).

After microclimate tourists attraction creation, landscapes designers need to comprehensively communicate with managers and dynamic operators of those tourists attractions in natural and social microclimate meanings and features as well as future interactive microclimate creations and management patterns within those space designed within particular locations (Fig. 5: ②→⑤; ⑤→②). The managers and dynamic operators, in the bottom operation layer, routinely interact with tourists and is in charge of interpreting the natural and social symbolic microclimate for tourists. He/she likewise organises and manages daily creation and construction of interactive microclimate that tourists actively participated through interacting with tourists and inviting their active participation, co-creating a planned and sustainable interactive microclimate in particular locations or sites (Buonincontri, Morvillo, Okumus, & van Niekerk, 2017; Lucrezi, Saayman, & Van der Merwe, 2015) (Fig. 5: ③). For example, in a local hotel, manager provided specific microclimate tourists attractions as parts of microclimate products and services according to local climate and culture. In Specific time of a day and a year, such as in 10:24 a.m./May/2017, 20:18PM/September/2017 and 01:22 a.m. (midnight)/April/2018 (Fig. 6: ①, ②, ③), natural microclimate and social climate integrated together within this hotel various differently. Then, manager and tourists co-created interactive microclimate such as drinking tea in the morning (Fig. 6: ④), eating dinner cooked by tourists from Sichuan province (Fig. 6: ⑤), and midnight talking with local alcohol and tourists' stories (Fig. 6: ⑥). Combining natural, social and interactive microclimate, manager creatively provided tourists attractions of microclimate tourism for tourists, which became vital and meaningful memories for tourists in microclimate tourism (Fig. 6: ⑦, ⑧, ⑨). As a result, the manager directly manages dynamic operations of the microclimate environment to enrich tourists' experience and achieves a direct supply of products and services to earn profits.

Considering this advantage, the manager interacts with tourists to obtain accumulative tourists information of preferences, demands and behavioral tendencies. Then they actively interacts with the natural and social landscapes designers, investors and strategic planners to promote dynamic operations and specific adaptation for various changes on microclimate tourists attractions, which is a constant and sustainable interaction in microclimate tourists attractions provision mechanism (Fig. 5: ④→⑤→⑥→①→②→③). Therefore, for sustainable supplying tourists attractions in microclimate tourism, the supply-side not only need to focus on microclimate tourism resources utilisation and management but also need to constantly interact with each layers of supplier as well as tourists in microclimate tourism practices.

3.3.3. Dynamic flow and flexible organisation mechanism of microclimate tourism

From the tourist perspective, the whole tourism process comprises relative static and dynamic movement situations. These situations emphasises the relative static microclimate experience in particular tourism locations, such as museums, restaurants, and parks, as well as focus on tourists' dynamic movement from one location to another so as to comprehensively experience the whole process (Orellana, Bregt, Ligtenberg, & Wachowicz, 2012). Apart from the on-site mechanism

and tourists attraction supply mechanism of microclimate tourism, a dynamic flow of microclimate tourism exists from one microclimate product or service to another provided by diverse suppliers along the whole microclimate tourism process. Diversity embraces power. Thus, microclimate tourism emphasizes diversity of supply and demand as well as their flexible and dynamic arrangement in microclimate tourism market from broader perspective. Tourists' primary preferences tendency vary from one type to another that summarized by Tourism Management such as agri-, cuisine, dark, dive, eco-, film-induced, hedonistic, outdoors/national park, romance, sex, slow, spa, space, sports, sun lust, virtual, volunteer and wellness tourists. Consequently, the provision of microclimate tourism products and services will focus on tourists' preferences to design and arrange creatively through utilizing single microclimate or combinative microclimate tourism resources. For example, along river diverse microclimate tourists attractions were designed and constructed through creatively embracing and utilizing natural, social or interactive microclimate tourism resources (the coloured circle represents different microclimate characteristics) (Fig. 7: A). For tourists who have relatively stable microclimate preferences of microclimate tourism products and services, flexible organisation of microclimate tourism could operate and arrange microclimate products and services for tourists through combinations of various microclimate tourists attractions with relatively similar microclimate (such as Fig. 7: B, C, D microclimate tourists attraction combinations provided for type 1,2 and 3 tourists for their stable microclimate preferences). Moreover, flexible organisation of particular microclimate tourism products and services for tourists prefer different and comprehensive experiences of diverse microclimate also could be arranged and managed through combinations of tourists attractions with diverse microclimate (such as Fig. 6: E).

Tourists firstly experience one microclimate tourists attraction will influence their psychological and mental perception and their further experience feeling of another microclimate tourists attraction. Thus, flexible organisation of microclimate tourism products and services for tourists emphasizes the time sequence effects. The designed time sequences of microclimate tourists attractions for satisfying tourists' demand could be varied from one type tourist to another. More precisely, tourists will be influenced by former microclimate experiences and will participate in subsequent microclimate experiences, thereby obtaining a unique and diverse microclimate experience flow during the whole journey. This case will directly or indirectly generate diverse combinations of microclimate tourism products and services for tourists. For instance, along river microclimate tourism products and services combinations could be arranged in time sequence of ①→②→③→④→⑤→⑥→⑦→⑧→⑨→⑩, ⑩→⑨→⑧→⑦→⑥→⑤→④→③→②→① or other flexible time sequences organisation in Fig. 6:E. Moreover, because of dynamic natural and social microclimate changes, tourist preferences and decisions changes, as well as other uncertainty, microclimate tourism combination possibilities also could be flexible arranged in a planned journey. Therefore, the dynamic flow of tourists from one microclimate situation to another could designed and organized uniquely to satisfy tourists' preferences from the dynamic microclimate tourism flow and flexible organisation perspective.

4. Considering microclimate tourism security and safety for the sustainable development of microclimate tourism

Studies on climate and tourism security and safety have overlapping research domains for microclimate tourism security and safety research. Climate-related risk, climate security and climate change-related security and safety in different sectors and regions of the world have been analysed and explored profoundly (Carlton & Jacobson, 2013; Meinel & Abegg, 2017; Mushtaq, 2017). Meanwhile, among various risk studies in the tourism industry (Kapuściński & Richards, 2016; Olya & Al-ansi, 2018), climate- and climate change-related risk (Winter 2008), risk assessment (Olya & Alipour, 2015; Toimil, Díaz-Simal, Losada, &

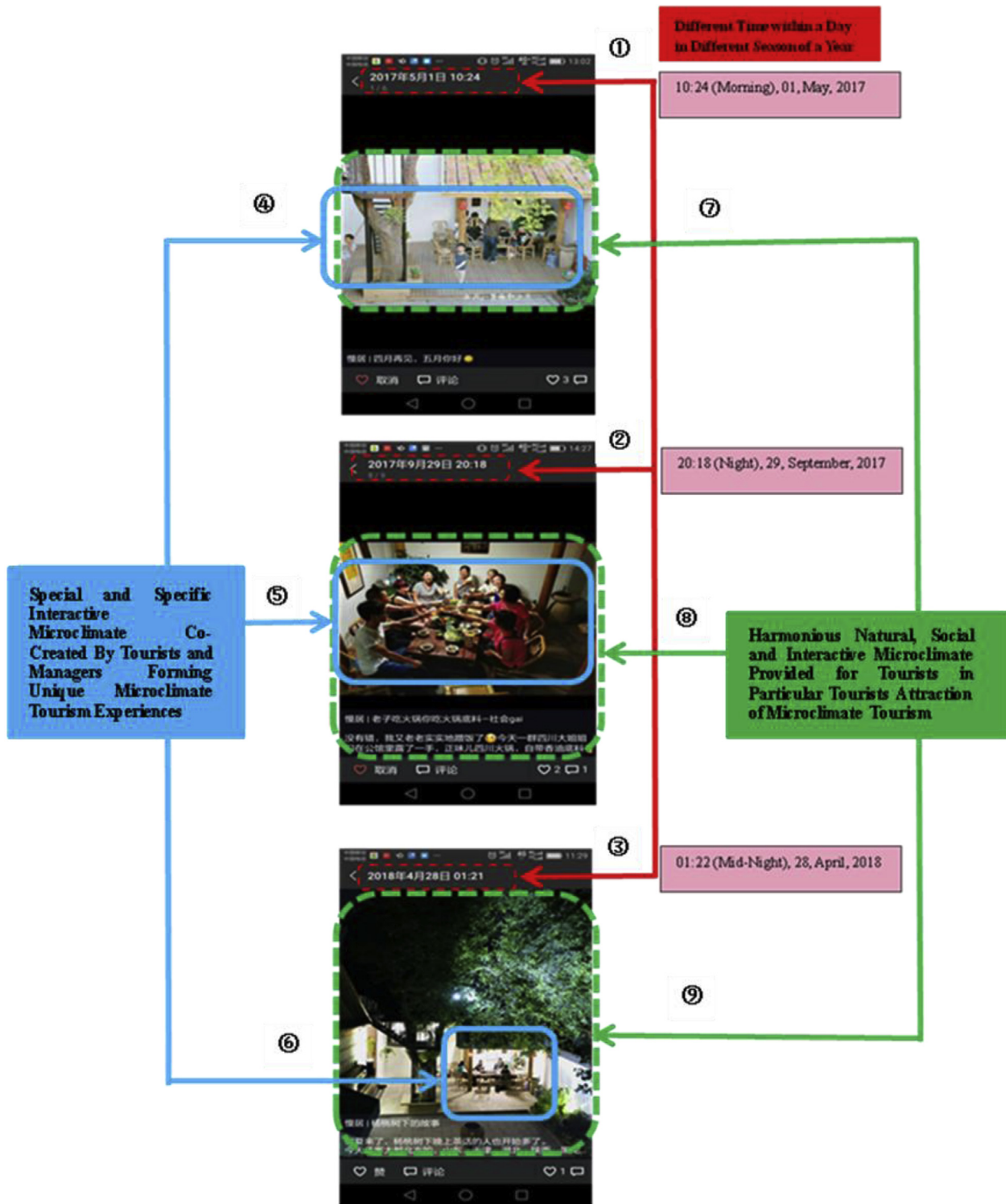


Fig. 6. Tourists Attractions of Microclimate Tourism Provided in A Local Hotel. Note: Photographs were provided by the manager of Yangtao Mansion in Quanzhou City, China.

Camus, 2018), tourists’ risk perception (De Urioste-Stone et al., 2016) and temporal and spatial analyses (Craig & Feng, 2018) have also been analysed and explored theoretically and practically. Microclimate tourism security and safety considers natural, social and natural-social-tourist interactive security and safety issues for tangible tourists attractions of microclimate tourism, tourists and tourism industry for proper management and sustainable development of microclimate tourism in tourism market.

4.1. Tangible tourists attractions security and safety of microclimate tourism influenced by natural microclimate

4.1.1. Tangible tourists attractions security and safety of microclimate tourism in closed or semi-enclosed space

As for insecurity and unsafe risks of tourists attractions caused by natural microclimate in closed or semi-closed space, the high, low or fluctuated temperature will change molecular structure and chemical

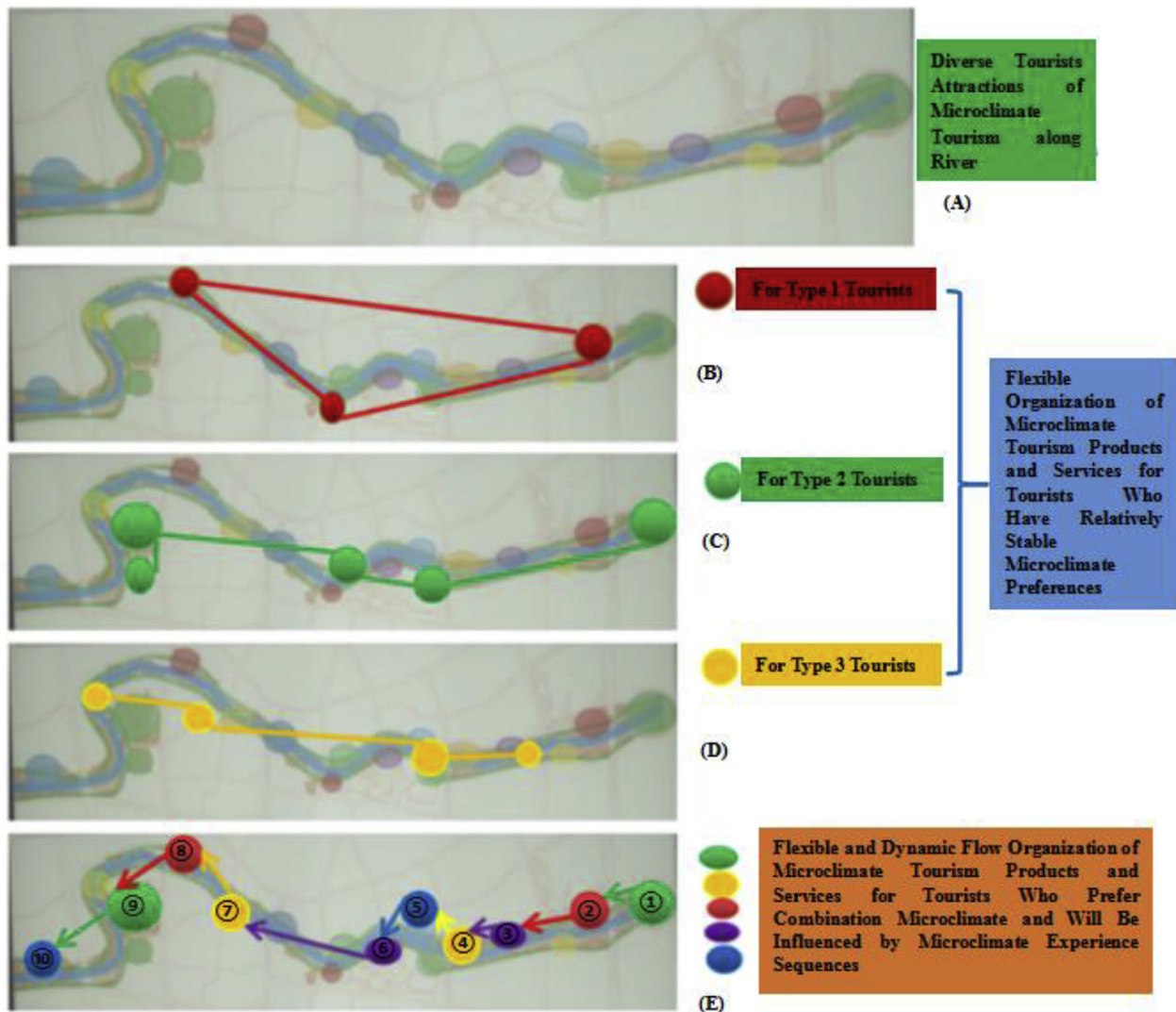


Fig. 7. Dynamic flow and flexible organisation mechanism of microclimate tourism along river.

reaction of tangible materials; inappropriate humidity will accelerate materials' adsorption-desorption of humidity effect and then lower or destroy material intensity, which also will result in adsorbing harmful air components effect of materials and then further lead to various chemical reactions of materials like acidification or oxidation; and inappropriate illumination intensity not only will increase temperature that summarized above but also promote photo-oxidation and photochemical reaction for materials (Wang, 2007; Zhou, 2010) (Fig. 8: ①). For instance, in museum for lacquer wares, light intensity and its heat releasing effect have influenced relative humidity of exhibition cabinets for lacquer wares, which will cause irreparable damage of lacquer wares and lead to heritage security issues in the long term (Lei, 2005); both in the museum of Emperor Qin's Terra Cotta Warrior and the underground museum of Hanyang Tomb, extremely fluctuated temperature and humidity, acid aerosol and water-soluble components have threaten various heritages through physical and chemical weathering effects (Jia, 2015); and in traditional heritage buildings, internal temperature, humidity, complicated air components and dynamic wind environment have impacted or even corroded architecture materials (Fabbri & Pretelli, 2014; Litt & Audenaert, 2018).

When more and more tourists' flux into closed or semi-closed space also will influence natural microclimate and then further influence tangible tourists attractions of microclimate tourism (Fig. 8: ②). For instance, in diverse Crystal Palace Caves, the monitoring data have

shown that constant opening for tourists have increased temperature and CO₂ emission, decreased humidity and negative oxygen ion concentration, and long period of high color light intensity have caused damage of calcium carbonate sediment landscapes as well as the internal ecosystem in caves (Šebela & Turk, 2014; Zhang et al., 2017). Increased tourists also have brought deposition of particulate matter such as PM_{2.5} and PM₁₀ into indoor environment (Worobiec et al., 2008). These situations also have happened in tombs (A H Anuar et al., 2017; Liu et al., 2017), museums (Jia, 2015) and other heritages sites or buildings (Li, 2015; Peng, 2017) and then have directly or indirectly destroyed or even deteriorated various tangible tourists attractions of microclimate tourism. Additionally, the microclimate capacities will also be challenged to some extent, leading to unsafe and insecure situations for microclimate tourist attractions.

4.1.2. Tangible tourists attractions security and safety of microclimate tourism in open space

In open space (Fig. 9), natural climate factors have more powerful influence on tangible tourists attractions of microclimate tourism, causing particular security and safety issues. More precisely, exterior facing and internal structure of various social landscapes have been damaged by natural microclimate such as frozen injury of heritages architecture in cold temperature spaces (Sun, 2015; Wang, 2016, p. 2), long terms precipitation and high humidity erosion of granite memorial

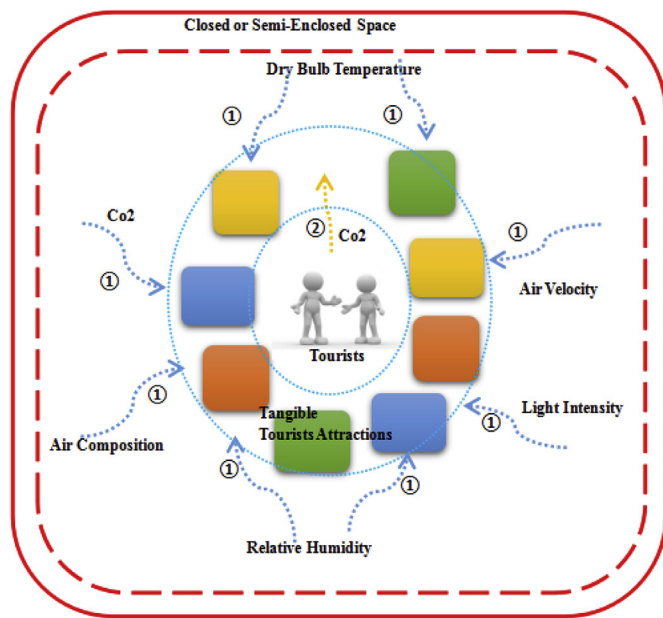


Fig. 8. Tangible tourists attractions security and safety of microclimate tourism in closed or semi-enclosed space.

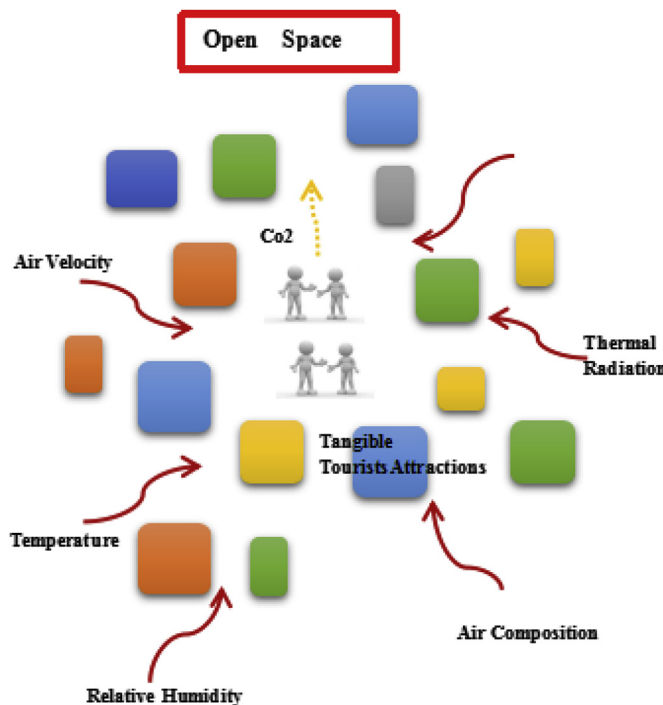


Fig. 9. Tangible tourists attractions security and safety of microclimate tourism in open space.

tower (Pan, Mao, & Ni, 2006; Zhang, 2002), and discoloration and alkalization of brick walls that influenced by fluctuated temperature and high moisture air, acid gas and heavy acid rain (Jiao, 2016; Zhang, 2013). Moreover, various disasters also have formed and accelerated by influence of fluctuating weather conditions in specific locations and its general microclimate characteristics. Because of arid microclimate, drought intensification, long period of high temperature and no precipitation, drought disasters have happened severely and have caused secondary disasters, damaging specific landscapes of microclimate tourism. For example, steppe fire and forest fire have happened in grassland of Hulun Buir and Inner Mongolia (Liu, 2018; Zhou, Wang, &

Zhou, 2016) and in forest of Da Hinggan mountains and other forest locations (Shu, 2011; Zhao, 2017) as well as diverse agriculture landscapes (Li & Yang, 2015). Accelerated by strong wind and drought microclimate, sand-dust storm have impacted microclimate tourists attractions in cities (Gao et al., 2014; Zhao, D, Li, Zhang, & Hu, 2013) and oases (Ling, Xu, & Zhang, 2011). Due to humid microclimate, high frequency of precipitation and heavy intensification of precipitation weather, flood disasters have often happened in locations with higher temperature and humid microclimate characteristics, especially along landscapes of middle and lower reaches of rivers and nearby areas such as the Changjiang River (Gu, Zhou, & Yu, 2015), Lijiang River (Zhang et al., 2015) as well as many cities (Cheng & Li, 2015); snow disasters have occurred in locations having lower or extreme low temperature and high humid weather, which have destroyed various plants for natural landscapes (Liu, 2010) and damaged diverse social landscapes in cities (Ma, 2017; Wu, 2016). Therefore, natural microclimate have caused insecure situations for diverse microclimate tourists attractions, which significantly hindered microclimate tourism development.

4.1.3. Measures and suggestions for tangible tourists attractions security influenced by natural microclimate

For security and safety of tangible tourists attractions in closed or semi-enclosed spaces, various innovative approaches have been utilised. For example, an innovative envelope material, i.e. hygro-adsorbing plaster, for microclimate enhancement and retrofit of historic buildings and artworks preservation (Pigliautile et al., 2018); effectively new heating systems have been used for the preventive conservation of the cultural heritage in historic churches (Varas-Muriel & Fort, 2018); computational fluid dynamics (CFD) modeling have been utilised for analysis or stimulation of moisture dynamics (D'Agostino & Congedo, 2014), gas and aerosol deposition (Cole, Paterson, & Lau, 2007), ventilation control (D Agostino, Congedo, & Cataldo, 2013), and salts crystallization control (D Agostino, Congedo, & Cataldo, 2014); green and sustainable lighting techniques also have been promoted in illumination of new energy as well as LED have been controlled by smart techniques (Barraca, Almeida, Varum, Almeida, & Matias, 2016; Peng & Zhou, 2018); passive microclimate technique (Saeli & Saeli, 2015) and non-destructive techniques such as geophysical techniques for moisture control (Barraca et al., 2016; Martínez-Garrido, Fort, Gómez-Heras, Valles-Iriso, & Varas-Muriel, 2018) also have been suggested. Moreover, open hardware device for remote monitoring (Gaudenzi Asinelli, Serra Serra, Molera Marimón, & Serra Espauella, 2018), energy-efficient internet of things (Perles et al., 2018), intelligent decision-support systems (Kaklauskas & Gudauskas, 2016) have been smartly applied in smart system of indoor microclimate control (Muñoz-González, León-Rodríguez, & Navarro-Casas, 2016; Stazi, Gregorini, Gianangeli, Bernardini, & Quagliarini, 2017).

For security and safety of tangible tourists attractions of microclimate tourism in open spaces, microclimate numerical simulation for forest fire (Wang & Niu, 2016), sand-dust storm (Jia, Li, Li, Tang, & Huo, 2015), flood (Cheng & Li, 2015), snow storm (Du & Liu, 2017) or other microclimate-related disasters have been utilised for analyzing induced security and safety mechanisms. Monitoring and early warning models and system with GIS, Hadoop and internet of things techniques have been established (Chen, 2006; Fei, 2018; Feng, Yin, Yang, & Liang, 2018; Li, 2017; Liu, 2015; Yu, 2015; Zhao, Liang, & Peng, 2018). Specific security and safety assessment (Wuyun, 2014; Zhou, 2014) and adaptive and sustainable management strategies of microclimate (Chen, 2016) also have been carried out through techniques of 2D city, big data and refined models (Li, 2009; Li et al., 2009; Liu, 2015; Xie, 2013; Yang, 2018) as well as adaptive city design such as sponge city (Wen, 2016; Zhu & He, 2017) and landscape design (Chen, 2016; Tao, 2017).

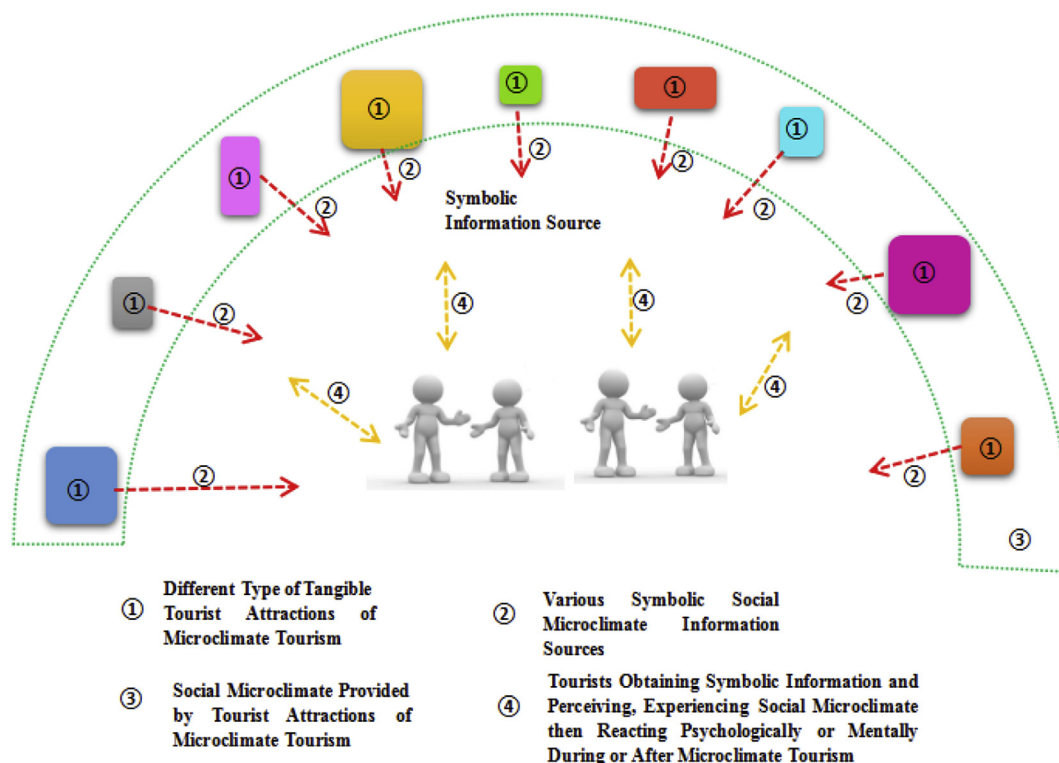


Fig. 10. Tourists security and safety influenced by social microclimate.

4.2. Tourists security and safety of microclimate tourism influenced by social microclimate and interactive microclimate

Tourists will be influenced by tangible and symbolic social microclimate provided by particular microclimate tourism products or services. Through tangible and symbolic information source, tourists obtain information and then perceive, experience and react to the social microclimate, which will cause psychological or mentally security and safety issues of tourists during or after microclimate tourism (Fig. 10). Meanwhile, consciously or unconsciously organized by managers of particular products or services of microclimate tourism, various tourists-participated interactive microclimate have been created that influenced under specific social microclimate. For example, manager-tourists interactive microclimate, tourists-tourists interactive microclimate, and large scale tourists participated interactive microclimate (Fig. 11) have triggered various tourists security and safety issues during microclimate tourism process. Meanwhile, the social microclimate and tourist interactive microclimate of particular tourist attractions, such as festivals in streets and squares, will be affected by various factors and cause unsafe situations for tourists. For instance, the festival microclimate embraces various uncertain risks when tourists physically or mentally participate in festival processes to create an experiential social climate (Davis, 2016; Organ, Koenig-Lewis, Palmer, & Probert, 2015). In addition, fireworks festivals (Feng et al., 2016), love parades (Huang, Chen, Wang, & Yuan, 2015), music festivals (Ronchi, Uriz, Criel, & Reilly, 2016) will cause security and safety issues of physical injury and health damage, crowded chaos and trampling in large-scale festival evacuations.

4.2.1. Tourists psychological security and safety of microclimate tourism

Social microclimate that experienced by tourists in specific microclimate tourism products and services have directly influence tourists' psychological or mental security and safety through perceiving various tangible and symbolic social microclimate information. Among diverse tourism practices, death microclimate, often called dark tourism, focus on present-oriented microclimate construction in transitory space for

tourists to experience death and darkness (Podoshen et al., 2018; Zheng, Zhang, Qian, Zhang, & Nian, 2016), which often too dark to experience. Increasing tourist-interactive death microclimate tourism also embraces emotional, reflective and intrapersonal insecure and unsafe situations provoked by conflicting information amidst death microclimate with orthodox information on contemporary media, social convention and politics (Poade, 2015; Podoshen, Venkatesh, Wallin, Andrzejewski, & Jin, 2015; Yan, Zhang, Zhang, Lu, & Guo, 2016; Zhang et al., 2016). Meanwhile, interactive microclimate of adventure microclimate tourism have caused psychological fear emotions for tourists when facing different dangerous and insecure situations (Carnicelli-Filho, Schwartz, & Tahara, 2010; Cater, 2006). Worry (Larsen, Brun, & Øgaard, 2009) provoked by previous crimes (Ryan, 1993), crisis (Luo & Zhai, 2017; Rittichainuwat, 2013; Zenker, von Wallpach, Braun, & Vallaster, 2019) and disasters (Cró & Martins, 2017; Rittichainuwat, Nelson, & Rahmafritria, 2018) in particular locations of microclimate tourism have significantly formed unsafe social microclimate, which have directly impacted psychological security of tourists in microclimate tourism process as well as future security and safety expectation and re-perception.

4.2.2. Tourists personal and health security and safety of microclimate tourism

Tourist interaction and behaviour involved in the social microclimate also have different types of risks that cause personal and health security and safety issues for tourists, such as risks related to diverse activities organized or provided during microclimate tourism processes (Yang et al., 2017). For tourists personal security and safety, violence and violence-related crimes have embedded in tourists participated interactive microclimate (Barker, Page, & Meyer, 2003; Park & Stokowski, 2009; Sönmez, 1998) and have triggered alcohol-related assault and sexual assault (Botterill et al., 2013) for women (Yang et al., 2017) and young tourists (Calafat et al., 2013), which also have involved tourists into being killed, mugged and drugged situations while traveling (Dioko & Harrill, 2019; Howard, 2009) or in hotels (Hua & Yang, 2017). Moreover, terrorism and terrorist attacks (Aziz, 1995;

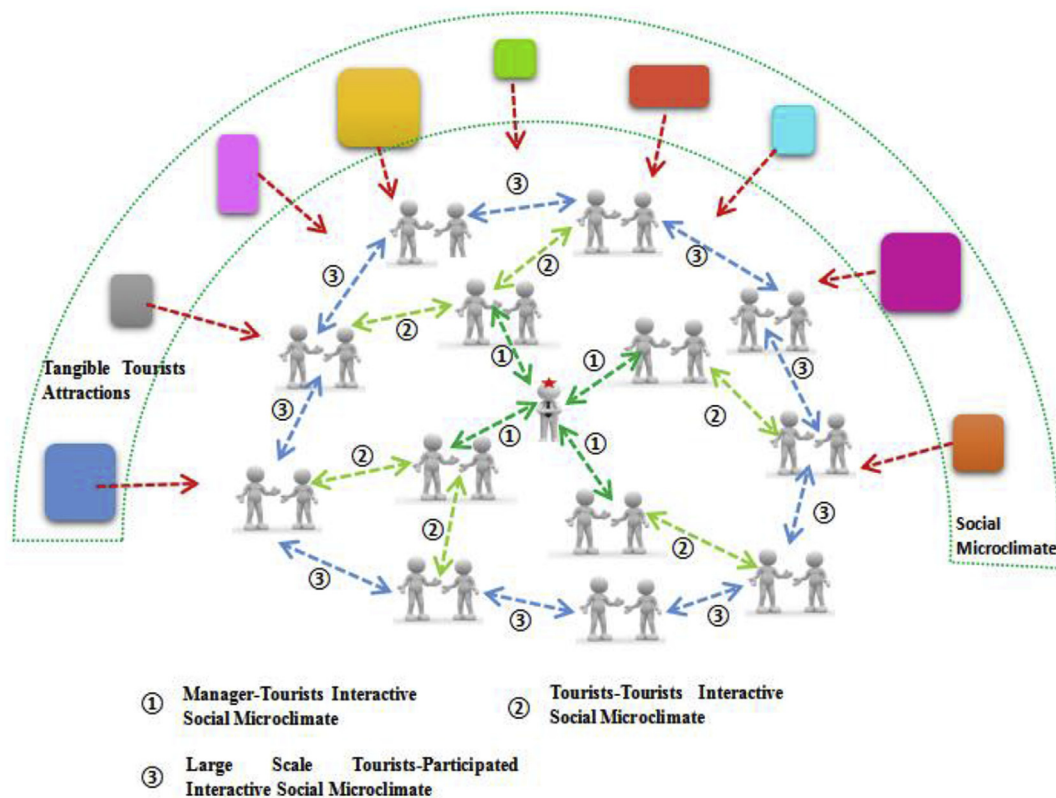


Fig. 11. Tourists security and safety influenced by interactive microclimate.

Cater, 2006) also have occurred in specific locations (Lanouar & Goaid, 2019; Liu & Pratt, 2017) of microclimate tourism and have targeted tourists for attack (Wu & Du, 2016), which have threaten personal security and safety of tourists. Additionally, tourists participated interactive microclimate with animals such as elephants (Luo & Zhai, 2017), dolphins (Guerra & Dawson, 2016), cheetahs and lions (Okello, Manka, & D Amour, 2008) or other animal-based interactive experiences (Campos, Mendes, Valle, & Scott, 2017), especially in wildlife safaris (Akama & Kieti, 2003), have threaten tourists personal security and safety by means of animal attacks.

Participating into specific interactive microclimate of microclimate tourism products or services also have affected tourists health security and safety. For instance, interactive microclimate of sex (Ryan & Kinder, 1996; Ryan & Trauer, 2005), commercial sex (Ying & Wen, 2019) and romantic safaris (Omondi & Ryan, 2017) in particular strip clubs (Hesse & Tutenges, 2011) for male and female (Weichselbaumer, 2012) tourists have limitations (Ford, 2002) and risks (Berdychevsky & Gibson, 2015; Jordan, 1997; Matheson & Finkel, 2013). Those situations have caused various sex-related diseases such as HIV for tourists, influencing their health security and safety. Other risks like surgeries of organ transplantation and beautification (Chuang, Liu, Lu, & Lee, 2014; de la Hoz-Correa et al., 2018) in medical microclimate tourism have threaten security and safety of tourists' health or even their lives. Drug misuse of synthetic stimulants and hallucinogens is also serious in dance music festivals (Lajos & Zoltán, 2014; Mohr, Friscia, Yeakel, & Logan, 2018) or at campsites in a social-spatial relation context (Dilkes-Frayne, 2016), which also causes drug addiction of commercial cannabis (Wen, Meng, Ying, Qi, & Lockyer, 2018) and influences health security and safety of tourists. Additionally, Interacting within sunshine and sunburn microclimate tourism products and services, sunburn have more likely to develop skin disease into skin cancer for tourists, especially for children, which have high risks of threatening tourists' health security (Peattie, Clarke, & Peattie, 2005).

4.2.3. Tourists financial security and safety of microclimate tourism

When tourists immerse into interactive microclimate of casino and gambling, they will not only face property unsafe problems (Prentice & Wong, 2015; Shen, 2013) but also psychological and mental risks to overexcite gambling all their money, which will cause severe financial social security and safety for them (Gu, Li, Chang, & Guo, 2017; Wu & Chen, 2015). Tourists also have been theft in hotels (Hua & Yang, 2017), during sport events such as the 2000 America's Cup (Barker, Page, & Meyer, 2002) or other mega-events (Getz & Page, 2016; Kim, Jun, Walker, & Drane, 2015; Müller, 2017) when diverse tourists with different backgrounds have interacted into crowded locations. Additionally, tour guides played vital role in interactive microclimate of microclimate tourism (Mak, Wong, & Chang, 2011; Tsaur & Teng, 2017; Zerva & Nijkamp, 2016) have many misbehaviors (Tsaur, Cheng, & Hong, 2019) such as maliciously forced tourists to have transactions (Lin & Huang, 2013; Ye, 2015) or defrauded money and property from tourists (Wang, 2012), causing tourists security and safety of property.

4.2.4. Measures and suggestions for tourists security and safety influenced by social and interactive microclimate

For security and safety of tourists in microclimate tourism, it is essential to improve tourists security and safety perception of different kind of microclimate tourism destinations (Zou & Zheng, 2014a) with diverse insecure social and interactive microclimate, such as rural areas (Zou & Zheng, 2014b), seaside (Zhang, 2011), high altitude mountains (Liu & Hu, 2014) and some destinations with dangerous interactive microclimate (Yang & Xie, 2018) in microclimate tourism. Through organizing active and healthy social and interactive microclimate tourism products and services to promote tourists physical and psychological health (Liu & Cui, 2013), which also need to emphasise tourists' emotional solidarity (positive sentiments one feels for another) with destination residents (Woosnam et al., 2015). Constructing social and interactive security and safety microclimate (Zou & Xie, 2013; Lin, Lai, & Zou, 2017) to guide secure and safe tourists behaviors through

systematic arrangement of microclimate tourism security and safety marks, warning signs (Zhang, 2017) and signal detection (Paraskevas & Altinay, 2013) as well as systematic microclimate tourism security and safety assessment (Zhang, 2018; Zou & Zheng, 2014c).

According to social and interactive microclimate characteristics of natural locations such as mountains, forests (Huang, 2007), roads (Shi, 2014), caves (Meng, 2016) and islands (Chen, 2015), and social locations such as minority area (Zheng & Fan, 2008), hotels (Gao, Chen, Hu, & Song, 2015), exhibitions (Liu & Fan, 2012), cruise (Zhu, 2015) etc., to implement accurate and effective microclimate tourism security and safety early warning and management (Paraskevas & Quek, 2019). Moreover, based on tourists' features to arrange specific tourists security and safety management such as the aged (Wu, 2015), the self driving (Zhang & Luo, 2016), and outbound tourists (Huang, 2017) in particular social and interactive microclimate. Rooted in the public microclimate tourism security and safety system (Zhang & Xie, 2015), it is vital to provide various social and interactive microclimate tourism security and safety information through internet and mobile (Yu, 2015) to achieve effective information communication (Lu, 2012) and quick emergency response and rescue for tourists (Zhao, 2013), which also will be promoted by improving effectiveness and efficiency of microclimate tourism security forces (Simpson, Simpson, & Cruz-Milán, 2016; Cruz-Milán, Simpson, Simpson, & Choi, 2016; Dong, Zheng, & Yin, 2018) as well as enhancing tourists' trust in destination security officials (Walters, Shipway, Miles, & Aldrigui, 2017).

4.3. Industrial security and safety of microclimate tourism in microclimate tourism market

4.3.1. Low microclimate tourism resources distribution efficiency threaten existential security and safety of microclimate tourism

Lacking understanding and in-depth exploration of microclimate tourism resources have caused low utilisation and distribution efficiency of microclimate tourism resources and their creative integration (Zhang, 2011) in microclimate tourism. Most natural and social microclimate only have been treated as simple tourism resources that granted by nature and society while interactive microclimate only being created in some cases (Huang, 2014; Ma & Zhang, 2017). Thus, most of natural, social and interactive microclimate have not been inputted into specific microclimate tourism products and services production or only simply utilised them without any processing. The low distribution efficiency of microclimate tourism resources (Li & Xiao, 2016; Xu & Zhou, 2013; Zheng, Liang, & Dong, 2015) have caused limited production efficiency and inferior quality (Zhang & Zhong et al., 2015) of specific microclimate tourism products and services in microclimate tourism market. Moreover, it also have threaten existential security and safety of microclimate tourism within fierce competition environment.

4.3.2. Products and services homogeneity threaten diversity security and safety of microclimate tourism

From a broad perspective, specific natural, social and interactive microclimate design, construction, organisation and management of particular tangible or intangible tourist attractions (Béréziat, 2017) are the essences of microclimate tourism. Promoting by up-soaring demands of natural microclimate with comfortable temperature, humidity, wind velocity and health air components (such as negative oxygen ion) in China microclimate tourism market, microclimate tourism products and services have been created and provided in specific locations where have comfortable microclimate and fresh air (especially full of negative oxygen ion), called as Oxygen Bar for short (Fig. 12). However, similar or approximate microclimate tourist attractions have appeared in rural areas, minority areas (Pan & Wu, 2014), hot-spring destinations (Shen, 2016; Yuan, 2012), and ancient towns (Zou, 2017) of microclimate tourism market. Specific microclimate tourism products and services also have appeared homogeneity,

such as microclimate tourism commercial products of artworks (Tan, 2017, p. 5) and souvenirs (Chen, 2013) in microclimate tourism destinations as well as services of tourism companies (He, 2013; Mei, 2010), which have resulted in low level of homogeneous competition (Becerra et al., 2013; Karlis & Polemis, 2018) and caused industrial unsafe and insecure situations of market diversification. Consequently, disadvantages of supply side of microclimate tourism will fail to satisfy tourists' increasing demands and lack abilities to construct an effective and efficient innovation mechanism for triggering creative and sustainable development of microclimate tourism, causing industrial insecurity of microclimate tourism.

4.3.3. Lacking creative microclimate tourism talents threaten sustainable development security and safety of microclimate tourism

For sustainable development of microclimate tourism, creative microclimate tourism talents such as tourism planners (Shortt, 1994), landscapes, products or services designers (Asplet & Cooper, 2000; Gupta, Dash, & Mishra, 2019; Heide, Lærdal, & Grønhaug, 2007; Hornig, Chou, Liu, & Tsai, 2013), managers (Elbanna, 2016), tour guides, and employees in different sectors of microclimate tourism have become more and more important human resources to creatively and integratively utilise and create natural, social and interactive microclimate tourism resources (Gu, 2017, pp. 152–160; Mei, 2010; Zhang, 2015), producing specific microclimate tourism products and services. However, increasing demands of microclimate tourism talents with diverse education backgrounds or talents teams with complementary abilities (Baum, 2015; Ooi, Hooy, & Mat Som, 2015) have faced situations of limited talents supply both in quantities and qualities (Shi, 2014). Thus lacking creative microclimate tourism talents will profoundly hinder industrial sustainable development of microclimate tourism causing security and safety issues. For example, lacking microclimate tourism talents with interactive microclimate creation, organizing and managing abilities to co-create experiences together with tourists (Eide, Fuglsang, & Sundbo, 2017) by managers (Ballantyne, Hughes, & Bond, 2016), tour guides (Wong & Mc Kercher, 2012), and other operators will not comprehensively take advantages of microclimate tourism characteristics and then lose comparative competition advantages in microclimate tourism market.

4.3.4. Suggestions for industrial security and safety of microclimate tourism

For sustainable development of microclimate tourism for guaranteeing industrial microclimate tourism security and safety in China, the microclimate tourism security and safety governance should be considered (Fig. 13). Different governance powers of microclimate tourism security and safety that need to be considered and involved are as follows: government for providing public climate goods; market for providing specific natural, social and interactive microclimate as private climate goods of companies or individuals; and other social powers such as NGOs for providing quasi-public climate goods between two extremes of public and private goods of microclimate tourism (Feng, 2014; Liu, 2014). The integrated and sustainable development system of microclimate tourism security and safety governance need to be explored and developed. Natural and social climate technology, microclimate information, microclimate culture and microclimate tourism resources together permeate into all aspects of microclimate tourism that is supported and guaranteed by microclimate tourism security and safety governance (Wang, Ming, & Wang, 2012). This situation generates a harmonious and interactive integrated and sustainable development system for microclimate tourism and microclimate tourism security and safety governance (Fig. 13), which can enrich understanding of microclimate tourism resources for fully utilisation in specific microclimate tourism products and services provision. Moreover, it will further diversify provisions to avoid homogeneity and accelerate creative microclimate climate tourism talents cultivation and integration in microclimate tourism market. On the basis of the integrated and sustainable development system of microclimate tourism security and

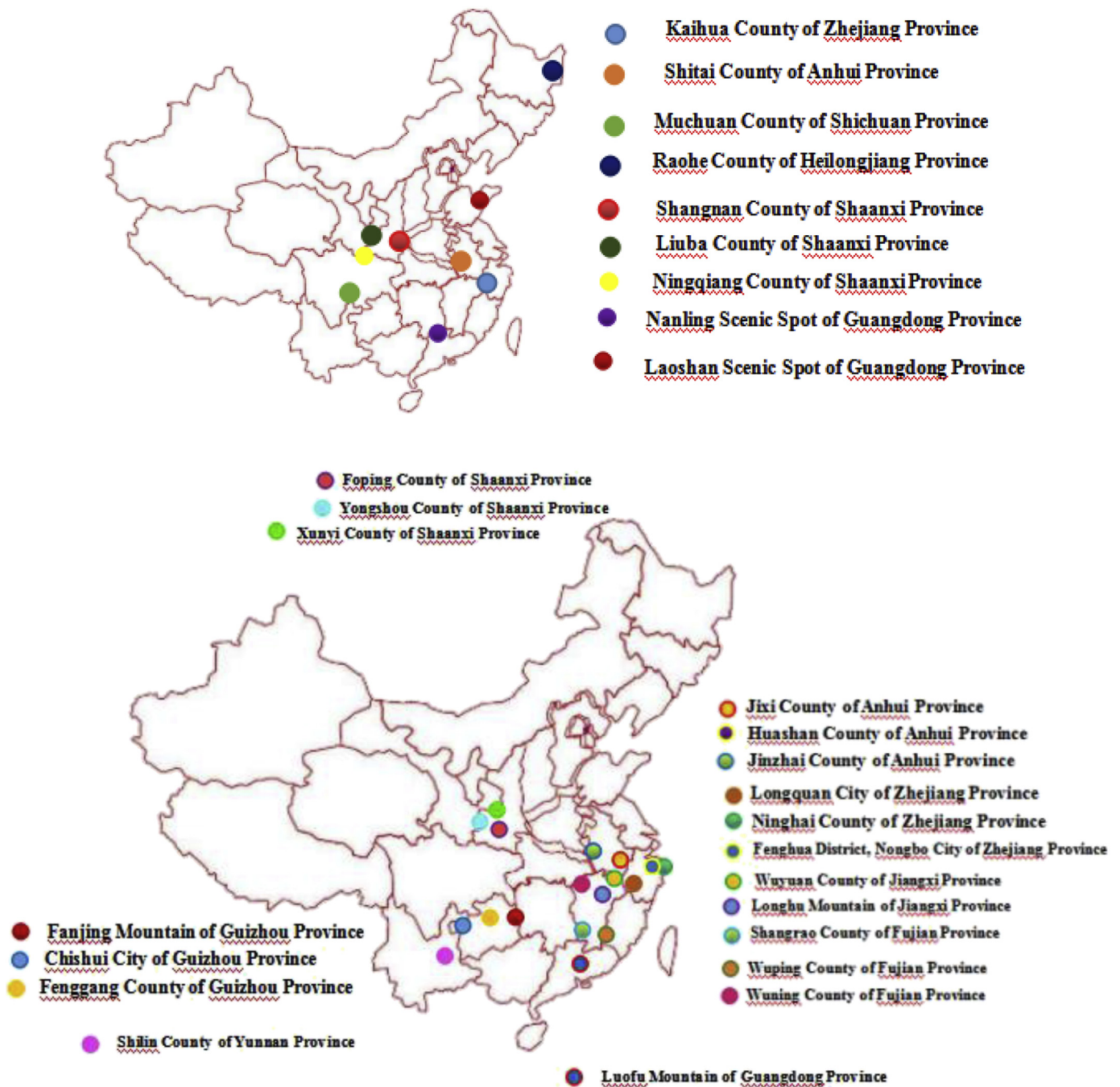


Fig. 12. Products and Services Homogeneity Threaten Diversity Security and Safety of Microclimate Tourism in Specific Locations of China with Comfortable Natural Microclimate and Fresh Air (especially full of negative oxygen ion).

safety governance, regional and trans-regional market, government and other social powers must cooperate to enlarge co-governance, co-establishment and co-win interaction mechanisms actively (He & Zhang, 2016; Ma & Zhang, 2016; Zheng & Wang, 2011) to accelerate microclimate tourism resources utilisation and distribution efficiency, to enrich microclimate tourism products and services diversity through taking comparative advantages of local and trans-regional resources, to enlarge creative microclimate tourism talents and talents teams through organized talents flow and co-learning mechanisms.

5. Discussion and conclusion

5.1. Discussion

Future microclimate tourism researches also need profound and constant exploration and some future research direction could be summarized as follow:

To promote microclimate tourism in specific society or particular segment market, it is essential to explore in-depth integration of natural, social and interactive microclimate in contemporary technology trend for providing more customized products and services for tourists.

For creative and sustainable development of microclimate tourism, it not only need to focus on local microclimate characteristics but also need to explore diverse microclimate combination and integration

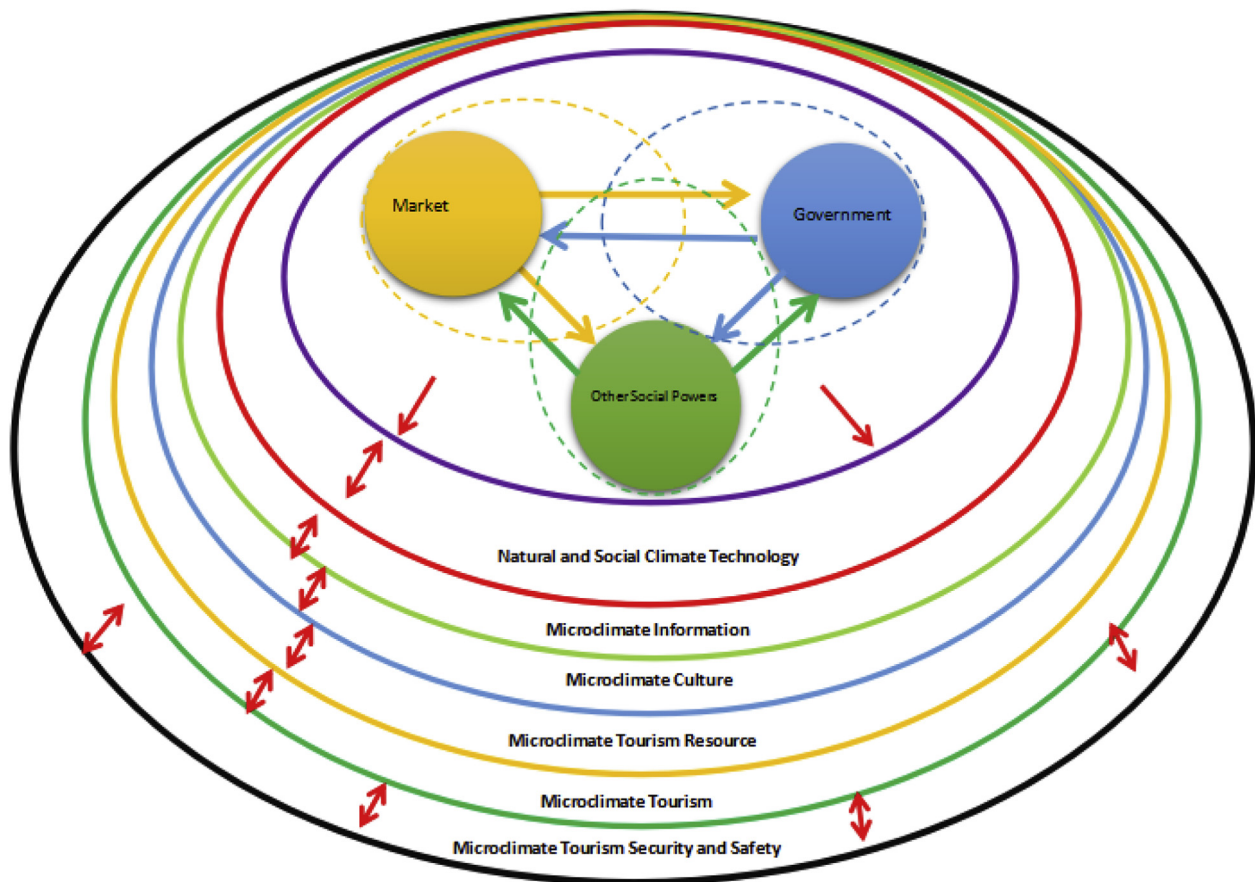


Fig. 13. Integrated and sustainable development system of microclimate tourism security and safety governance.

possibilities according to tourists' dynamic demand changes. This also encourages to provide more diverse microclimate resources communication and integration opportunities through establishing online platform of microclimate tourism resources market.

Natural, social and interactive microclimate integration also need to utilise contemporary meteorological technology and natural microclimate technology creatively to accelerate social and interactive microclimate formation and dynamic adaptation.

5.2. Conclusion

From the tourism discipline perspective, this study defines comprehensive climate and microclimate concepts on the basis of theoretical and practical explorations into tourism discipline and practices. Creatively from the interdisciplinary and trans-disciplinary perspective, this study firstly proposes the microclimate tourism concept and further analyses its mechanisms for the theoretical generalisation of its practices. Through consciously involving climate and microclimate into the tourism industry as vital resources, this study further analyses basic on-site microclimate tourism mechanism, basic tourists attractions supply mechanism, and dynamic flow and flexible organisation mechanism for promoting creative and diverse microclimate tourism products and services productions in China microclimate tourism market. For sustainable development of microclimate tourism, microclimate tourism security and safety that influenced by natural, social and interactive microclimate also have been defined and analysed as well as relative measures and suggestions have been proposed.

Author contribution

Xiaoyan Yang (Corresponding author) contributes to previous

materials collections, analysis and completes the whole manuscript writing (from original idea to the holistic writing logic construction) and editing.

Liang Dong contributes to give some constructive advice and understanding of natural micro-climate from architecture and landscapes disciplines.

Changshun Li contributes to provide material of China Oxygen Bar assessed and granted by China Meteorological Service Association from 2016 to 2017.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.tourman.2018.12.012>.

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