Important progress and future prospects for studies on urban public recreational space in China

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Abstract: As the main sites of urban residents' recreational activity in a mass leisure era, urban public recreational space (UPRS) is the primary component of urban public spatial systems. To satisfy current demands for the construction of livable cities and to meet the challenges of UPRS development in an urbanizing context, a scientific and systematic review of the latest developments in UPRS research is important for developing this field. Based on 1264 papers from the China National Knowledge Internet and the Web of Science from 1985 to 2018, this study examined research developments on UPRS in China. Through a quantitative literature analysis, we divided UPRS-related research in China into three stages of development: the starting period (1985–2000), the growth period (2001–2009), and the consolidation period (2010–2018). Next, we identified nine “hot” research topics on UPRS and reviewed developments in each of these. These topics were the classification of UPRS, spatial structure and layout, comprehensive evaluation, planning and development, the impacts of UPRS development, spatial–temporal evolution laws and mechanisms, space imagery features, sustainable utilization, and governmental decision making on UPRS. We also systematically reviewed the research methods and spatial scales used in UPRS-related studies in China. In response to deficiencies in existing research, we put forward several suggestions regarding future research: Chinese UPRS studies should focus on basic theoretical research; construct a new research system that accounts for Chinese characteristics, based on interdisciplinary and multilevel spatial integration; develop a humanistic philosophy and build management systems for UPRS that can lead to the development of world-class cities based on a global vision.

Keywords: era of mass leisure; urban tourism; urban public recreational space; quantitative analysis; China

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1 Introduction

Internationally, the first studies on “recreational space” appeared in the 19th century. In 1979, the concept of “recreational space” was introduced to China by researchers in Taiwan, China (Huang and He, 1979). Because recreational activities have increasingly become the main content of people’s leisure consumption, “recreational space” has been distinguished from spaces for other social and economic activities.

In terms of spatial hierarchy, the concept and connotations of urban public recreational space (UPRS) have not been uniformly defined, and scholars have used multiple interpretations. From a unidimensional spatial hierarchy perspective, UPRS is regarded as a material space defined as an open space, building, or facility that is located in a city or suburb, where visitors can enter and leave freely, that has some recreational function, such as entertainment, rest, shopping, sightseeing, communication, exercise, or tourism (Wu *et al.*, 2003). From a dual-dimensional spatial hierarchy perspective, UPRS is regarded as a binary space system that combines a material recreational space and an urban socioeconomic recreational space (Feng, 2006b). Scholars, taking this latter perspective, analyze the spatial structures while also paying attention to recreational activities and behavior within the UPRS (Qin, 2003). From a three-dimensional spatial hierarchical perspective, UPRS is considered a complex spatial system composed of a material space formed by recreational venues and facilities, an action space occupied by recreationists, and a space of capital and power under the control of government departments and economic management organizations (Ye and Bao, 2009a).

The continual growth of rapid urbanization, UPRS is an important aspect of assessing urban social civilization and the quality of life of residents. Clearly, the planning and development of UPRS are significant for improving the livability of the city and increasing urban residents’ happiness. The imbalance between the surging demand for participation in recreation and the inadequate amount of UPRS severely restricts urban residents’ happiness and the livability of the city. To solve the problems (e.g. over-crowdedness, road congestion, and the misuse of UPRS) caused by high-intensity recreational activities in specific time periods (e.g. weekends and holidays), scholars have carried out many studies on UPRS from multiple perspectives. This previous work has made great progress in understanding UPRS in China and has put forward some constructive suggestions about the layout, rational planning, space design, and service fairness of UPRS.

The development and expansion of cities, the advancement of industry, and changes in people’s recreational activities have had new impacts and brought new challenges for the planning and layout of UPRS, the supply of facilities, and the design of experiences and activities. In particular, in the era of mass leisure, the convenience, comfort, and high quality of residents’ recreational experiences are essential for the construction of livable cities and the sustainable development of cities. Questions of how to adapt to the changes in the role of UPRS in urban development and how to coordinate the relationship between recreational space management and city construction have increasingly attracted the interest of scholars across various disciplines, such as urban planning, tourism geography, and landscape architecture. To cope with the growing problems of UPRS development in this new era, a scientific and systematic review of the latest developments in UPRS research is urgently needed to promote the development of this research field.

This article presents the results of a quantitative analysis of data from the China National

Knowledge Internet and the Web of Science, drawing on 1264 articles on the theme of “recreational space in China” that were published from January 1985 to September 2018. This study examines and summarizes research developments on UPRS in China, including the main contents and topics covered, research methods, and spatial scales of relevant studies, to identify current “hot” research topics, existing problems, and future directions for UPRS research.

2 Characteristics and contents of UPRS research in China

This section reviews the main features and contents of UPRS research in China and summarizes the research methods and spatial scales used in this existing work.

2.1 Main characteristics of UPRS research in China

The main characteristics of UPRS research in China include phase characteristics and hierarchical structure characteristics.

2.1.1 Phase characteristics of UPRS research in China

From 1985 to 2018, the number of UPRS-related articles published in the journals increased (Figure 1). Especially after 2000, researchers paid more attention to UPRS in the context of the leisure tourism era. Based on the number and growth rate of articles published per year, we divided China’s UPRS-related articles into the following three stages of development:

Figure 1 Stage characteristics of urban public recreational space research in China from 1985 to 2018

(1) Starting period (1985–2000). During this period, with the reform and opening up of policy, as well as domestic socioeconomic growth, China’s leisure and recreation industry began to develop. At the same time, the concept of recreational space was introduced in research in China. Research contents and topics were mainly based on the analysis of the contents, methods, historical developments, and recreation planning theory found in Western research. Although the literature published during this period was relatively limited, these pioneering achievements served as good preparation for later research.

(2) Growth period (2001–2009). During this period, with China’s tremendous socioeconomic development, there were changes in people’s lifestyles and attitudes toward recreation. People’s awareness increased regarding the importance of daily participation in recreational

that topic; the larger the radius, the more attention that topic was given. The lines connecting the nodes indicate key word co-occurrence; the thicker the connection line, the higher the frequency of key word co-occurrence. The number on the connection line indicates the frequency of co-occurrence.

Figure 2 illustrates the framework of UPRS research in China, presenting a hierarchical structure with features similar to a grade structure known as “stars holding the moon.” The core is “recreational space,” which is analogous to the moon. Around “recreational space” are various research issues that can be regarded as the stars; these include urban parks, landscape architecture, recreational belt around a metropolis, tourism resources, urban tourism, and recreational functions.

2.2 The topics and contents of UPRS research in China

According to the knowledge network of UPRS research in China based on the co-occurrence of key words and the hierarchical structure of UPRS research in China, the present article summarizes the topics and trends of UPRS research (Table 1). The identified research topics included the classification of UPRS, spatial structure and layout, comprehensive evaluation, planning and development, impacts of UPRS development, spatio-temporal evolution laws and mechanisms, space imagery features, sustainable utilization, and governmental decision making.

Table 1 Direction of urban public recreational space research in China

Research topic	Research tendency	Percentage (%) ^a
Classification of urban public recreational space	According to different classification standards, including the service object's attributes, function of recreation, recreational activity, spatial form, attributes of tourism resources, scope of service, geographical location, and composite attributes	4.19
Spatial structure and layout	e.g. Elements, structural models, distribution laws and contributing factors, and ideal structural patterns	12.58
Comprehensive evaluation	Evaluation of recreational space quality, assessment of accessibility, comprehensive evaluation of the quality of the recreational environment, assessment of the recreation value	16.06
Planning and development strategies	Optimal allocation, management of recreational land, factors influencing allocation	38.37
Impacts of urban public recreational space development	Relationship between UPRS and urban residents' happiness, the impact of urban recreational business districts on urban development	6.17
Spatio-temporal evolution laws and mechanisms	Characteristics, laws, dynamic mechanisms of evolution	3.09
Space imagery features	Space imagery features related to urban residents and visitors	4.03
Sustainable utilization	Reasonable utilization of urban industrial heritage sites, historic streets, and industrial abandoned lands; the post-competition utilization of Olympic venues; integration of UPRS components	5.46
Government decision making on UPRS	Government administrative departments choosing different integrative schemes based on realistic conditions in cities	1.03
Other	Economic issues, cultural connotations, recreation consumption patterns, intergenerational transformation of recreationists' behavior (Dong <i>et al.</i> , 2015); recreation conflict in UPRS (Wong and Yu, 2012); economic valuation of the amenities of UPRS (Jiao and Liu, 2010)	9.02

^aPercentage of all articles from 1985 to 2018 on each specific research topic

2.2.1 Classification of UPRS

Classification is the first fundamental step in research on UPRS, playing a supporting role in further theoretical, research and practical planning. Driven by different research objectives, scholars have adopted different classification systems to categorize UPRS. According to the service object's attributes, UPRS has been divided into two categories: for residents vs. for external tourists and residents (Wu *et al.*, 2003). In terms of the recreational function, UPRS has been categorized as commercial recreational space, self-supporting recreational space, or public supply recreational space (Ma, 2005). According to the recreational activity, UPRS has been classified by park type, fitness track type, sports venue type, and other types (Wei *et al.*, 2016). In terms of spatial form, physical space has been categorized as planar, block, or linear recreational space; for behavioral space, the form has been divided into planar space (e.g. park walks, public recreational squares, and public reading rooms), and three-dimensional space (e.g. climbing, skydiving, and diving) (Qin, 2003). According to the attributes of tourism resources, UPRS has been divided into recreational spaces for natural sightseeing, humanistic sightseeing, artificial entertainment, sports, and folk experience (Li *et al.*, 2011). According to the scope of service, UPRS has been classified as regional, urban/town, community, or indoor recreational spaces (sorted from large to small types) (Qin, 2003). In terms of geographical location, UPRS has been divided into urban, suburban, and urban fringe recreational spaces.

Most of the above methods have classified UPRS on a single dimension. UPRS is an interdisciplinary research topic with multiple, varying dimensions, so it is difficult to reach a consensus on unified classification criteria. From the perspective of structuralism, Ye Shengtao and Bao Jigang (2009a) used duality to describe the elements of the urban recreational spatial structure, creating an index of urban recreational spatial morphology. These scholars established a classification framework known as the ROP-ENCS. This framework divided UPRS into four main types (experience-leading, nature-leading, culture-leading, and service-leading). In future, the classification of UPRS will necessarily be more complicated to account for continual change in residents' recreational preferences.

2.2.2 Spatial structure and layout of UPRS

Along with increases in people's recreational time, the type and amount of UPRS have also increased systematically. Studies on the spatial patterns and distribution regularity of UPRS provide a theoretical basis for reasonably allocating and efficiently managing UPRS. The study of the structure and layout of UPRS systems can be summarized using the following three components:

(1) Study of the elements of recreational space systems. From the perspective of spatial form, the UPRS system is composed of three parts—namely, point (sightseeing spots), line (recreational corridor), and surface (recreational center) (Feng, 2010). In terms of supply and demand, the UPRS system is composed of recreational supply elements (government, economic organization), recreational demand elements (urban recreationists), and the connection between the supply and demand elements (recreational channels and recreational routes) (Xiao and Song, 2008). Some scholars view this differently, arguing that the elements connecting supply and demand are recreational sites and facilities (Ye and Bao, 2009a).

(2) Study of the structural model of recreational space systems. The spatial pattern of UPRS varies from city to city, and some changes can be seen within the same area across

different periods. Initially, there was little UPRS and it was all a single type. The center of UPRS was often found in a single place, revealing a single-core structural model (e.g. the West Lake as the former core recreational center of Hangzhou). Even now, some small cities need only one large urban park to meet the recreational demands of most people. However, with socioeconomic development and the rising need for recreation, urban recreational centers are often distributed across various places, and UPRS systems have multi-core or group structural models; this is often the case in metropolises such as Beijing, Shanghai, or Chongqing.

The urban recreation spatial structural model is also largely influenced by the urban spatial form and the natural environment. Where there are rivers or seashores, the UPRS structure tends to take the form of a band (e.g. the Seine River in Paris or both sides of the Yellow River). Certain kinds of topography and geomorphology also influence UPRS structures. For example, in metropolitan areas located on plains (e.g. Chengdu, Beijing), UPRS forms a circular structure pattern (Yu, 2003; Feng, 2010). However, because UPRS systems each have various types and functions, these systems' structure usually takes a composite form (Table 2). The structural models can provide planners and policy makers with a theoretical basis that can be used in UPRS planning and assessment. However, in actual application, there may be discrepancies, to a certain extent, from any UPRS structural model because of the models' limitations and many other factors such as the city size, natural environ-

Table 2 Composite structure models of urban public recreational space

Type	Schematic diagram	Applicable area	Model creator
Galaxy model		—	(Yu, 2003)
“Core-point-band” model		Dalian City, Liaoning Province, China	(Xiao and Song, 2008)
“Field-feature” dualistic structure model		—	(Ye and Bao, 2009b)
“Center-group-sector-ring” spider network structural model		Guilin, Guangxi Province, China	(Feng, 2010)

ment, and socioeconomic development.

(3) Study of spatial distribution laws and contributing factors of UPRS. Studies of spatial distribution patterns and the factors influencing UPRS can provide a reference for reasonable urban development planning. Most existing studies do some work to describe the distribution characteristics, spatial aggregation patterns, evolution rules, and driving mechanisms of UPRS for specific case studies, using geographical statistics, nearest-neighbor indicators, and spatial analysis with geographic information system (GIS) software. Such case studies have involved Beijing, Shanghai, Wuhan, Chongqing, Dalian, Nanchang, Shaoxing, and other cities (Wu, 2001; Gu and Bao, 2002; Wu and Jia, 2002; Xiao and Song, 2008; Huang *et al.*, 2009; Huang *et al.*, 2010; Liu *et al.*, 2010b; Wu and Tian, 2012; Li, 2014). The results of these analyses have shown that the UPRS around the city generally appears in spatial clusters. However, there are significant differences between different types of aggregation. The average distance from UPRS to the urban center varies widely, and this is related to whether the UPRS is of the artificial entertainment type, humanistic sightseeing and sport type, or natural sightseeing type. The analysis of the driving mechanisms of spatial distribution features indicates that tourism resources, distance from the city center, landform, rivers, and other factors have an important impact on the distribution of UPRS (Su *et al.*, 2004; Liu *et al.*, 2010b). In recent years, to analyze UPRS in depth, some scholars have investigated the effect of a single influencing factor on the spatial pattern of UPRS (e.g. examining the impact of a low-carbon public transport system on UPRS spatial distribution) (Wang *et al.*, 2017a).

2.2.3 Comprehensive evaluation of UPRS

The evaluation of UPRS plays an essential guiding role in UPRS planning and development. Studies on the evaluation of UPRS have mainly included the following four aspects:

(1) Evaluation of recreational space quality. Recreational space quality is a relatively new research topic in the field of UPRS analysis and evaluation. Recreational space quality depends on whether the space can effectively meet the needs of its users. Potential factors influencing recreational space quality involve various aspects, such as recreational facilities support, recreational activity planning, recreation image recognition, and recreation operation guarantee (Xin and Hu, 2016). Existing studies have mainly used the recreational perceptions (Feng *et al.*, 2009) and satisfaction index (Xiao and Du, 2011; Lian *et al.*, 2012; Mao *et al.*, 2013) of visitors to assess UPRS quality. An indicator assessment model has been established, considering the characteristics of the specific UPRS and the main service object (e.g. the elderly, children, or residents). The Analytic Hierarchy Process method was designed to quantitatively evaluate recreational space quality using data from questionnaires and interviews.

(2) Assessment of UPRS accessibility. Quantification of UPRS accessibility is a prerequisite for evaluating and reasonably allocating UPRS with consideration for equity in decision making and planning. Accessibility is a commonly used indicator for quantitatively measuring the degree of resistance people need to overcome to arrive at a particular destination. The main resistance factors include distance, cost, and time (Yu *et al.*, 1999). To assess accessibility, scholars initially calculated a simple ratio between supply of and demand for UPRS within the research area. After GIS tools were widely implemented, the scope of ac-

cessibility studies was greatly enriched. Most existing studies, based on data from various datasets, have measured accessibility using ArcGIS software. Some researchers have used traffic and distance data (Yue *et al.*, 2016; Wang *et al.*, 2017a). Others have argued that the functionality and attraction to recreationists of UPRS should also be taken into account in the evaluation (Ren and Wan, 2016), and other scholars have included road networks and population distribution data (Li and Liu, 2009; Yang and Shi, 2016). Some researchers working in this area have employed the Two-Step Floating Catchment Area method to appraise UPRS accessibility (Gu *et al.*, 2017; Wei, 2017).

(3) Evaluation of the recreational environment and service quality. Because the recreational environment and service quality of UPRS are key factors that significantly affect recreationists' satisfaction and consumption behavior, it is crucial to understand and evaluate both these factors. Through empirical and quantitative analysis, scholars have tried to analyze recreationists' perceptions and evaluations of the recreational environment and service quality. Depending on the particular context, researchers have selected different influencing factors and created specific assessment models. After assessing the recreational environment and service quality in Beijing, Shanghai, Tianjin, and 13 other metropolises in China, one study concluded that the three best cities in terms of recreational environment and service quality were Nanjing, Beijing, and Chengdu (Gan, 2004). Shanghai had low scores on the comprehensive evaluation of environmental quality and the functional level of ecological recreational space services. The main reason for these low scores was not that the amount of recreational space was insufficient, but rather the functional loss caused by low service coverage and uneven spatial distribution (Li, 2014).

(4) Recreational valuation of UPRS. The study of the recreational valuation of UPRS has important implications for the allocation and management of UPRS. The travel cost method is a popular evaluation method for assessing the recreational value of UPRS (Li *et al.*, 2010b). Some scholars have also conducted comparative analyses of the recreation value of urban ecological recreational space by dynamically observing recreationists' spontaneous recreation behaviors. The results of these studies have shown that areas with water activities year-round had the highest recreation value, followed by grasslands and woodlands, and that woodland recreational spaces had the highest recreational value for the elderly, whereas middle-aged people preferred water-area recreational spaces, and young people and children preferred grassland recreational spaces (Sun *et al.*, 2016b).

2.2.4 Planning and development of UPRS

The planning and construction of UPRS are important parts of urban planning and development. It is necessary to carry out reasonable planning and design to ensure that the elements of recreational spaces are in harmony with urban functions. Planning and design in China has increasingly attracted the interest of scholars working in various disciplines, who have carried out systematic studies from different perspectives.

In tourism geography, scholars have usually paid attention to morphological structures, distribution patterns, the optimal allocation of UPRS, and factors influencing the allocation and utilization of recreational land (Gao, 2009; Liu and Wang, 2009). In landscape architecture, researchers have often discussed issues such as the services, facilities, and landscape planning of UPRS (Chen *et al.*, 2016b); the coordination of architectural styles and urban

appearance; and construction and landscaping (Guo *et al.*, 2002; Chen, 2003). Urban planning researchers have focused on the reform and optimization of the UPRS system and the effects of UPRS in urban spatial planning (Yu and Zhang, 2015). Ecologists have concentrated on the impact of recreational activities on animals, plants, and the ecological environment.

Moreover, scholars from many other disciplines, such as sociology, management, culture, and economics, have analyzed the theoretical principles and planning strategies of UPRS (Wu, 1995; Ma, 2005) and evaluated UPRS safety (Chen *et al.*, 2010). Besides, Yang Jizhao *et al.* (2018) put forward a development strategy for urban recreational space system based on the “symbiotic theory”. Through the inclusion of perspectives from different disciplines in the above discussions, UPRS research has become more thorough and specific.

2.2.5 Impacts of UPRS development

Along with rapid urbanization and the improvement of residents’ quality of life in China, the planning and layout of UPRS have a great influence on the urban social culture, ecological environment, spatial structure, and urban landscape, all of which affect the stability and order of urban functions and operations.

To date, there have been many studies on the impacts of UPRS development outside China. Studies have focused on topics such as the influence of UPRS on neighborhood racial composition and neighborhood poverty (Duncan *et al.*, 2013), the importance of UPRS for promoting social justice (Pryor and Outley, 2014), the effect of UPRS for improving symptoms among elderly Chinese patients with dementia (Li and Li, 2017a), and the impact of UPRS on the urban ecological environment (Moshiri and Donyamali, 2012). However, the number and depth of such studies focusing on contexts in China are insufficient. Some studies have examined the relationship between UPRS and urban residents’ happiness (Gu, 2011) and the impact of urban recreational business districts (RBD) on urban development in China (Gu and Bao, 2002).

UPRS development has been shown to have both positive and negative effects. It is important for scholars to understand the overall relationship between the various functional elements of urban development and to discover imbalances and contradictions in this development to guide UPRS planning and optimize urban function. This will help to build harmonious, orderly, and livable cities.

2.2.6 Spatio-temporal evolution laws and mechanisms of UPRS

The study of spatio-temporal evolution laws and mechanisms of UPRS can enable the prediction of future evolution trends and provide theoretical support for the construction and development of UPRS.

To date, scholars have mainly used case studies to analyze the characteristics, regularity, dynamic mechanisms, and patterns of the evolution of UPRS for the purpose of further understanding UPRS (He, 2014; Lin, 2016). These analyses have mostly consisted of two dimensions. First, from the space perspective, the rules of UPRS evolution in most cities include not only the general, regionally differentiated rules, but also the gradually changing characteristics of recreational spaces in urban and suburban areas (Feng, 2009). Second, from the time perspective, because UPRS is a place for residents’ recreational activities, the increase and diversification of residents’ demands for recreation lead to the emergence of

various types of UPRS with different features and the transformation of the service object of recreational space from private to public (Table 3).

Table 3 Evolution characteristics of urban public recreational space in China

Economic development stage	Production mode and lifestyle of residents	Characteristics of urban public recreational space in China
Agrarian economy era	Most the society's wealth was concentrated in the hands of a few members of the ruling classes, and the vast majority of people lived a lifestyle of farming and self-sufficiency.	Recreational spaces were mainly owned by the ruling classes, and urban recreational spaces were closed. During this period, there was little UPRS. Landscape gardens in temples and suburbs that were not classified as royal or noble became the main places for people to enjoy their recreational time.
Industrial economy era	The basic purpose of the society was the excessive pursuit of economic benefits. People were eager for various recreational activities because of overwork.	During this period, because of the development of socialist democratic politics, people were freed from the shackles of autocracy, and a large number of recreational spaces that had been the private property of feudal lords were gradually opened to the public. Because of the rapid growth of the population in China and the impact of urban expansion, social spaces in neighborhoods had been replaced by high-rise buildings. As people's desire for communication increased, potential and practical recreational demands prompted cities to build a large amount of UPRS, such as museums and commercial streets.
Experience economy era	With improvements in people's living standards and changes in cognition, people's recreational demands are gradually diversified and personalized.	With changes in people's recreational demands, city development has gradually changed from aiming only to create recreational space to aspiring to construct UPRS that can meet the recreational needs of different classes of people.

Additional study in this area has found that different types of UPRS have distinct spatio-temporal evolution rules. Previous work beginning with analyses of historical Recreational Business District (RBD) forms have proposed three evolution models: the central business district model (e.g. Central District, Hong Kong) (Bao and Gu, 1998; Liu, 2003; Tao and Li, 2005), the new town center model (e.g. Tianhe, Guangzhou) (Bao and Gu, 2002), and the commercial street model (Chunxi Road, Chengdu). Other studies have analyzed the evolution of the RBD space shape in the information age, finding that the RBD evolution trends were multi-core, multilayered, and networked (Chen and Wu, 2007). The evolution of recreational belts around metropolises has been found to have undergone three stages of growth: pole evolution, point-axis evolution, and network evolution (Wu and Wu, 2005). Other studies have analyzed the evolution characteristics of the Shanghai recreational belt around the metropolis, finding that the evolution process has changed from dispersion to agglomeration, and the agglomeration shapes have evolved from scattered spots to growth poles, axes and eventually blocks (Dang *et al.*, 2017).

2.2.7 Space imagery features of UPRS

Using space imagery to analyze spatial structures is one of the methods used in spatial structure studies. Examining space imagery features is a popular way to illustrate perceptions of the surrounding environment, and this approach has attracted many scholars from the discipline of urban geography, especially urban social geography (Gu and Song, 2001). Recreationists' perceptions can influence use patterns and inform the planning and manage-

ment of UPRS.

The study of the space imagery features of UPRS is of great significance for city planning and construction with the goal of maximizing happiness, livability, and appropriate travel (Tian, 2013). Existing studies have taken urban residents and outside visitors as research subjects, seeking to analyze the UPRS imagery features through case studies using specific methods such as cognitive maps, imagery sketches, and questionnaire surveys (Yin *et al.*, 2010; Lin and Tian, 2011; Tian, 2013). Inspired by urban imagery theory, Tian Fengjun (2010) proposed the concept of the “recreation image complex”.

2.2.8 Sustainable utilization of UPRS

Understanding the use patterns and users of UPRS is necessary for effective planning and management (Chen *et al.*, 2018). Along with the widely applied sustainable development theory, the planning and design of UPRS does not only need to meet residents’ recreational needs, but also to integrate various types of land to provide UPRS in China, including urban industrial heritage sites, historic streets, abandoned industrial lands, residential green spaces, and sports fields (Zhang and Xia, 2008; Yi and Horton, 2015).

The key to the sustainable use of UPRS is coordination among the various elements (time, cost, and space for recreation), through a combination of material and socioeconomic planning (Manuel and Fred, 2004). Most existing studies are based on a systems perspective and consider the general elements of UPRS to include tourists seeking recreation, recreational resources, recreational services, and facilities (Liu, 2015). These studies have explored, for example, the integrative design of children’s UPRS on a commercial pedestrian street (Li and Li, 2017b) and the integrative design of UPRS and urban transportation (Liang and Luo, 2009). Other scholars have been concerned about the reuse of UPRS, especially the post-competition utilization of Olympic venues (Hu, 2006).

To date, studies on the sustainable use of UPRS have some problems in China. The core issue is the lack of studies on integration mechanisms and approaches in the process of UPRS construction. Most highly cited articles on UPRS have focused on the specific traditional types of UPRS, such as recreational belts around metropolises, urban RBDs, urban parks, waterfront recreational spaces, and urban green spaces. There has been insufficient work analyzing UPRS systems overall. At the same time, with the development of UPRS and the constantly changing demands of recreationists, many new types of UPRS have recently emerged; these new types include libraries, art museums, science and technology museums, and sports venues (Lu, 2013). However, to date, there has been a relatively limited number of studies on these new UPRS types in China.

2.2.9 Governmental decision making on UPRS

UPRS is an integral component of livable cities. These spaces play a critical role in how citizens spend their spare time. Rapid urbanization and spontaneous socioeconomic development have brought about profound change in residents’ recreational time and in per capita disposable income. Recreational activities have become an important way for people to alleviate pressure in their lives, and providing sufficient UPRS to meet citizens’ increasing needs is the responsibility of policy makers. Because of the increasingly diversified needs for recreation, UPRS provisioning has transformed from a public process dominated by the

government to a multiple provision mode with various suppliers. This has created a system of recreation provision with the central government offering public recreational services in national parks, the city government providing urban recreational opportunities, the public sector maintaining basic recreational services, and the private sector providing high-end, diversified recreational services (Zhang, 2010). Because UPRS is an essential component of public welfare, more humanistic concern for vulnerable groups is needed in the planning and design of these spaces. However, scholars have given little attention to this issue.

In the process of conducting this review, we noticed that UPRS has been associated with a number of government administrative departments (e.g. the Tourism Bureau, Forestry Bureau, Landscaping Bureau, Planning Bureau, Construction Bureau, Industry and Commerce Bureau, Cultural Bureau, Education Bureau, and Agricultural Bureau), and the management pattern of these spaces is characterized by fragmentation and multi-headed administration. Past work on UPRS has suggested four integrative schemes of government administrative departments based on the realistic conditions of cities: a) Cities driven by recreational tourism (Zhuhai and Lijiang) can manage the relevant functions under the Tourism Bureau; b) cities driven by commercial tourism (Beijing, Shanghai, and Shenzhen) can establish inter-ministerial consultation committees to be led by the Tourism Bureau; c) small and medium-sized cities where the tourism industry is undeveloped can manage related functions under the Cultural Bureau; and d) metropolises where the tourism industry is underdeveloped can establish inter-ministerial consultation committees led by the Cultural Bureau (Ye *et al.*, 2015).

2.3 Methodology and techniques in UPRS research in China

Research on UPRS in China cannot be carried out in an orderly manner without the support of relevant technological methods. In the process of summarizing existing studies on UPRS in China, we found that the research methods used mainly consist of descriptive analysis, conceptually based approaches, models, or statistical methods (Dann *et al.*, 1988). After China's UPRS research entered the growth period (2001–2018), examining the top 10 most highly cited articles each year, we found that the theoretical studies focused on descriptive and conceptually based methods, whereas the empirical studies focused on models and statistical methods. In these articles, statistical methods were the most frequently used (67.5%); these studies analyzed the evolution of the structure of recreational space (Huang *et al.*, 2010), the satisfaction of UPRS users (Xiao and Du, 2011; Lian *et al.*, 2012; Mao *et al.*, 2013), the spatial structure characteristics and distribution rules (Su *et al.*, 2004; Shi and Pei, 2007; Liu *et al.*, 2010b; Yang and Ma, 2015; Lin and Mao, 2017), and UPRS accessibility (Ren and Wan, 2016; Yang and Shi, 2016) using spatial metrology, remote sensing image processing, and other technical tools, with software packages such as AutoCAD, SPSS, and ArcGIS. Articles focusing on models (21.3%) mainly conducted analyses of the spatial system structure of UPRS (spatial discrete index method), recreational value evaluation (recreationists' perception distance), UPRS accessibility evaluation (network accessibility index), and comprehensive assessment of tourism destinations (spatial data overlay). Conceptual approaches (8.1%) were used widely in basic theoretical research on UPRS (Wu *et al.*, 2003), including analyses of the concept and its connotations, type division, components of the

UPRS system, and examinations of the driving mechanisms. Descriptive methods (3.1%) were mainly used in describing the UPRS development process (Chen, 2013), related literature reviews (Feng, 2006a; 2006b; Li *et al.*, 2014; Zhu *et al.*, 2014), and summaries of and comments on non-Chinese UPRS planning and design experiences (Wu, 1995; Fang and Wu, 2012; 2015; Yu and Zhang, 2015) (Table 4).

Table 4 Main application trends of methods in urban public recreational space research in China (2001–2018)

Research method	Main application trends	Percentage (%) ^a
Descriptive	Literature review, comments on non-Chinese urban public recreational space planning and design experiences	3.35
Conceptually based	Basic theoretical research, including the analysis of the concept of UPRS and its connotations, type division, the components of the UPRS system, and driving mechanisms	8.94
Models	Ideal structural pattern of UPRS, recreational value evaluation, comprehensive assessment of tourism destinations	21.23
Statistics	The evolution of recreational space structure, satisfaction of UPRS users, spatial structure characteristics and distribution rules, accessibility of UPRS	66.48

^aPercentage of the top 10 articles cited each year from 2001 to 2018 (179 papers in total) on each specific research method

GIS deserves special mention as a widely used technology in the disciplines of planning, geography, environment, ecology, and tourism that is also often used in UPRS research. The earliest work applying GIS spatial analysis techniques in recreation research appeared in the United States in the late 1960s (Luo *et al.*, 2006). After GIS technology was introduced in China, it was soon applied to UPRS research. Supported by GIS software, a variety of UPRS research has incorporated network analysis, spatial analysis, digital elevation analysis, and geographical statistics. These studies have mainly examined the connectivity and accessibility of UPRS, recreationists’ perceptions of distance, the distribution of recreational resources, the locations of UPRS, and spatial distribution characteristics. Hodges and Carlton (1972) used Synagraphic mapping tools to analyze UPRS locations and calculate the service radius of urban recreational centers.

2.4 The spatial scale of UPRS research in China

Aiming to explore issues, objectives, and approaches, UPRS research in China has been carried out at several separate levels, including state, regional (e.g. urban agglomeration, or province), city (e.g. Shanghai or Beijing), and within-UPRS levels. At the state level, studies have taken a macro perspective, focusing on the overall environment, service quality, policy analysis, and regional differences in UPRS, as well as China’s UPRS development strategies, upgrade plans, and future directions. The topics at the regional level are similar to those at the national level and mainly include development characteristics, facilities evaluation, environmental optimization, and development strategies for UPRS in different regions. Urban agglomeration, in particular, has attracted the attention of many scholars focusing on China at this level. Urban agglomeration is an ideal area for the development of tourism industry clusters and the centralized location of UPRS because of factors such as market size, convenient travel, and abundant land (Liu and Liang, 2015).

The city is the most common scale for UPRS studies. Research at this level began with

categorizing the type and quantity of UPRS. The next step was the analysis of the morphological structure and distribution regularity of different types of UPRS. Studies have also comprehensively evaluated the quality of the urban recreational environment, using data on the urban population size, the recreational atmosphere, the natural environment, and other related characteristics. For targeted analysis, scholars have often chosen specific types of UPRS or UPRS considered “typical,” such as recreational belts around the metropolises (Wu, 2001; Su *et al.*, 2004; Li *et al.*, 2010a), urban recreational business districts (Bao and Gu, 2002; Gu and Bao, 2002; Yu and He, 2003; Bian and Zhang, 2004; Tao and Huang, 2006; Chen and Bao, 2012; Zhu *et al.*, 2015; 2017), urban parks (Liu *et al.*, 2010a; Mao *et al.*, 2012; Mao *et al.*, 2013; Tao *et al.*, 2013; Feng *et al.*, 2014; Chen *et al.*, 2016a; Wang and Liu, 2017; Wang *et al.*, 2017b; Xiao *et al.*, 2017; Liang and Zhang, 2018), urban green recreational spaces (Zhang *et al.*, 2013; Jim and Chen, 2006), waterfront recreational spaces (Wu and Jia, 2002; Zhang *et al.*, 2011), suburban recreational spaces (Wang, 2003; Liu *et al.*, 2010b; Liu and Mu, 2016), ecological recreational spaces (Li, 2014; Sun *et al.*, 2016a; 2016b; Yang *et al.*, 2018), or theme parks (Bao, 1994; 1997; Lian *et al.*, 2012; Cheng *et al.*, 2016; Yan *et al.*, 2016).

There have also been studies on UPRS features on multiple dimensions from the perspective of multi-scale fusion and nesting patterns. With the socioeconomic development of small and medium-sized cities, the exploration and development of UPRS has attracted the participation of multiple stakeholders, including the Urban Planning Department, academics, and residents. Studies on UPRS have also branched out from a focus on large cities such as Beijing and Shanghai to examine small and medium-sized cities. Research about UPRS in small and medium-sized cities has focused on topics such as planning and design, the creation of a recreational atmosphere, the improvement of the quality of recreational experiences, and public administration policies.

3 Conclusions, prospects and limitations

3.1 Conclusions

Based on articles published on UPRS from the China National Knowledge Internet and the Web of Science databases, the present study systematically reviewed and discussed the main features and contents of UPRS research in China from 1985 to 2018, as well as addressing the research methods and spatial research scales employed.

(1) Overall, studies on UPRS in China show a growing scope and depth. Since 1985, scholars have carried out systematic research from different perspectives, at multiple spatial levels, and drawing on multiple methods. This work has yielded many enlightening research findings.

(2) The main characteristics of UPRS research in China identified in the present study included phase characteristics and hierarchical structure characteristics. We divided the research phases into the starting period (1985–2000), the growth period (2001–2009), and the consolidation period (2010–2018). Our presentation of the hierarchical structure features was accomplished using a “stars holding the moon” visual illustration of the knowledge network. In this presentation, “recreational space” was the core, surrounded by multiple re-

search issues.

(3) The topics covered by UPRS research in China show a trend toward interdisciplinarity and diversified development. Since 1985, Chinese scholars have conducted a great deal of empirical research in this area, including examinations of planning practices. This previous work has made critical contributions to China's macro-level strategy, regional development at different levels, and UPRS planning and development. To some extent, China has achieved an application of "theory guiding practice" and "practice promoting theory," through the mutual promotion of research and practice. The main topics addressed by UPRS research in China can be summarized by nine aspects: the classification of UPRS, spatial structure and layout, comprehensive evaluation, planning and development, the impacts of UPRS development, spatio-temporal evolution laws and mechanisms, space imagery features, sustainable utilization, and governmental decision making.

(4) The research methods used in UPRS research in China have changed from qualitative to primarily quantitative methods. The specific methods that have been employed include descriptive analyses, conceptually based approaches, models, and statistics, with statistics being the most frequently applied (67.5%), descriptive analyses being the least commonly used (3.1%), and models and conceptual-based approaches accounting for 21.3% and 8.1% of the examined studies, respectively.

(5) The spatial scale of the study is moving from the micro level to the macro level. Although the micro level remains the main spatial scale for UPRS research in China, studies on the state and region are increasing.

3.2 Future priorities and directions for UPRS research in China

In response to the problems and deficiencies identified in existing research, those conducting future work on UPRS in China should follow these recommendations:

(1) Future studies of UPRS in China should pay more attention to basic theoretical research and the expansion and deepening of the research content. Utilization of UPRS in Western cities has always been considered a basic right of city residents. This understanding has a profound social value basis that is clearly reflected in urban planning and design. Likewise, the theoretical approach to UPRS planning and development in Western contexts is systematic and mature, and related planning practices are relatively abundant in these contexts. However, in China, urban public space, especially UPRS, is a relatively new concept, and its research foundation is still weak. The study of UPRS involves multiple disciplines, such as urban planning, geography, recreational management, and landscape architecture. Input from the disciplines of sociology, culture, and ecology to research theory and practice in China currently lags behind the situation in Western countries.

In response to residents' urgent need for UPRS, and to guide the practice of UPRS planning and management during the process of rapid urbanization, we need to translate and adapt UPRS theories originating in Western studies to account for Chinese characteristics. This should include the basic concept of UPRS, as well as its connotations and classification systems. Promoting interdisciplinary and innovative research methods can help to build UPRS theory and to expand the content of research on UPRS in China. Although studies on UPRS have pointed to cross-disciplinary connections, the links between related studies are

not entirely clear. Future research efforts ought to enhance cooperation among various disciplines, such as tourism geography, urban planning, ecology, psychology, sociology, economic management, landscape architecture, and mathematical statistics. In this process, we should prioritize using innovative research methods, seeking new entry points, establishing a long-term database on UPRS from a multidimensional spatial hierarchy perspective, deepening the scope of empirical research based on primary data, and making full use of space-related socioeconomic statistical data in our research.

The infusion of humanistic concepts and categories is a popular trend in international UPRS research. Human needs, objectives, and benefits are the basis for the formation of UPRS. Research on UPRS in China should not only provide top-down, macro-level analyses of UPRS strategies; it should also include bottom-up, in-depth explorations of multiple subjects, including different classes, genders, and subcultures. Therefore, it is essential that researchers appreciate and examine the humanistic background behind UPRS phenomena from a philosophical perspective.

(2) This work should enhance the integration of UPRS in multiple spatial hierarchies and stress the importance of the spatial research scale. Spatial scale is the basis of UPRS research, and the spatial distribution of UPRS at state, regional, city, and within-UPRS levels ought to be further discussed, emphasizing the participation of governments, companies, and scholars at different levels.

At the level of the nation and region, with the advancement of China's new urbanization process, the planning and construction of UPRS in small and medium-sized cities are quite different from these processes in large cities. Therefore, it is necessary to research UPRS in small and medium-sized cities, specifically. The development rules for UPRS also differ significantly across regions, interactively influenced by various factors such as the natural environment, economic development, socio-cultural features, and macro policies. It is necessary to comparatively analyze the differences in UPRS progress in different regions to identify the factors and mechanisms so that practical resources can be provided for other similar geographical areas.

At the within-UPRS level, with the diversification of people's demands, there are individualized features in the utilization of UPRS. Compared with developed countries, China is rich in features such as urban industrial heritage sites, historic streets, abandoned industrial lands, residential green spaces, and sports fields, but the potential recreational value of these features has yet to be fully explored. The integration of various types of geographical areas will increase the amount and quality of UPRS, prompting an increase in the use of the established and future UPRS in China. An example of this type of integration is the Beijing 798 Art District, which is a typical case of the integration of an industrial heritage conservation area into a UPRS system. Research at the within-UPRS level needs to be deepened, further discussing issues including the complementary patterns and rational layout of different types of UPRS (e.g. urban parks, theme parks, recreational belts around metropolises, and RBDs) to contribute to optimizing the spatial layout and maximizing the recreational value of UPRS.

Although the academic community has made some progress in the study of UPRS from the perspective of two- and three-dimensional spatial hierarchies, more needs to be done in

this research area. It is necessary to strengthen the synthesis of research at various levels of UPRS, including the links between different types of physical UPRS. The integration of physical and socio-economic UPRS, and the integration of physical UPRS with recreational space and spaces of capital and power will allow UPRS research to form a complete system to promote UPRS sustainable development.

(3) It is necessary to strengthen the operation and management of UPRS and attend to the relationship between urban space and UPRS. The essence of UPRS management is the construction and management of a recreational culture and a recreational environment (Feng, 2006a). To realize the scientifically informed management of UPRS, it is necessary to strengthen related research such as work on investment, financing methods, capital operations, human resource management, relevant departments working in harmony with residents, evaluation systems before and after the construction of UPRS, the discovery and reproduction of recreational culture, the protection of recreation resources, and the organization and marketing of the recreational product.

In addition, UPRS is an organic part of urban space, and it is necessary to strengthen the comprehensive management of UPRS, optimize the location and spatial coupling of UPRS with urban space, and analyze the coupling mechanism and methods from macro, mezzo, and micro hierarchical levels.

(4) We should conduct research on UPRS in China from a globalization perspective and construct a new research system that considers the characteristics of the Chinese context. UPRS is a hallmark product of modernization and globalization (Shen, 2011). Along with the diversification of economic industry and globalization, people's lifestyles will turn increasingly toward diversification and individuation. At the same time, information exchanges will speed up around the world, promoting mutual learning between cities. In terms of UPRS, international planning experiences will provide useful references for UPRS planning and design in China. This process will help with the development of more UPRS that can satisfy the diversified recreational demands of people of different ages and from different cultural backgrounds.

Although international UPRS research can provide a starting point for China's UPRS planning, UPRS planning and development in China need to be adapted to the specific conditions of the Chinese context, highlighting the recreational behavioral characteristics of China's residents and taking into account differences in recreational demands across the country's regions. Based on the national conditions in China, Chinese government and relevant departments should formulate specific policies and systems for UPRS planning and establish a complete management system and policy guarantee system for UPRS.

However, national standards guiding the construction of UPRS in China are currently insufficient. It is necessary to set up a more detailed planning system and a standardized economic index that is adapted to China's national conditions, aimed at different types of UPRS and different planning levels (e.g. overall planning, regulatory detailed planning, constructive detailed planning, or landscape design), and to build a Chinese UPRS management system with a global vision. This could provide a policy basis and scientific support for the construction and management of UPRS in China.

3.3 The limitations of the study

This study has two main limitations in terms of research scope, which indicate the need for further research. Firstly, this study only examined and analyzed the studies of UPRS in China from a macro perspective. It may neglect studies on individualized and innovative UPRS. It may also ignore the differences in UPRS research caused by the regional development differences. Secondly, the method of data collection also has its limitations. For example, this study only looked at articles published on the Web of Science and China National Knowledge Internet databases. The literature search keywords of “recreational space in China” may lead to insufficient understanding of the research contents. Therefore, the data collection for UPRS studies should be more comprehensive and abundant in future research. Comparative studies at different research levels of UPRS in different development areas should also be addressed.

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