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## **CONSTRUCTION OF URBAN POPULATION LAYOUT GOVERNANCE MODEL UNDER SPORTS ECOLOGY**

### **Abstract.**

Under the overall goal of modernization of national governance system and governance capacity, the construction of urban sports governance system and governance capacity modernization is an important content to achieve the overall goal. This paper makes use of literature and data, and combines quantitative and qualitative analysis methods to study the governance model of urban population layout under the ecological sports in China. Based on the data of urban population density, using ArcGIS and spatial statistics, this paper analyzes the spatio-temporal variation characteristics of urban population density, and discusses the driving factors of urban population density change. The results show that: in the post-epidemic era, the governance model of urban population layout in sports ecology is single; The construction of sports facilities is weak, the effect of social sports guidance is not good, and the coverage of national physical fitness monitoring is limited. In order to strengthen the construction of optimal governance system of urban population distribution in the new era, we must increase public sports management services, establish diversified sports service supply mechanism and sports evaluation system.

The data extraction accuracy of the algorithm can reach 90%, and the data extraction efficiency is high, which provides a reference for the in-depth study of urban population layout governance model under the ecological sports.

**Key world:** urban population, layout governance model, sports ecology.

Побудова системи управління міським спортом та модернізація його управління є важливим чинником для досягнення загальної цілі розвитку відповідно до загальної мети удосконалення національної системи управління та підвищення його потенціалу. Відповідно до постійного розширенням масштабів міст та структури міського населення, занятості, виробництва, культурних звичав та інших чинників управління спортом та рівня обслуговування стало важливим фактором, що впливає на його ефективність. Нове поняття спортивна екологія відноситься до спортивної діяльності, в якій спорт, культура та екологічне середовище перетинаються між собою, залежать одне про одного, співіснують, інтегруються та розвиваються разом.

В науковій статті проведено огляд літератури з питання дослідження, проведено порівняння кількісних та якісних методів аналізу для вивчення моделі управління розміщенням міського населення з врахуванням екологічних видів спорту в Китаї. На основі даних про щільність міського населення, використовуючи ArcGIS і просторову статистику в статті проаналізовано характеристики просторово-часової варіації, щільності міського населення та обґрунтовуються основні фактори зміни щільності міського населення. Результати наших розрахунків показують, що: перше - у післяепідемічний період модель управління розміщенням міського населення з врахуванням екологічної складової показує, що будівництво спортивних споруд є недостатнім, ефект від соціального управління спортом є недостатнім, а охоплення національним моніторингом фізичної підготовки обмежене. Результати дослідження показують, що з метою побудови оптимальної системи управління розподілом міського населення в сучасних умовах, держава повинна збільшити кількість наданих державних послуг та покращити

управління спортом, встановити диверсифікований механізм надання спортивних послуг та удосконалити систему оцінки спорту. Точність отриманих даних за алгоритмом може досягати дев'яносто відсотків, а ефективність даних є достатньо високою, що є орієнтиром для поглибленого вивчення моделі управління розміщенням міського населення з врахуванням екологічних видів спорту.

**Ключові слова:** управління, міське населення, модель управління, екологія спорту.

## **ПОБУДОВА МОДЕЛІ УПРАВЛІННЯ РОЗТАШУВАННЯ МІСЬКОГО НАСЕЛЕННЯ З УРАХУВАННЯМ СПОРТИВНОЇ ЕКОЛОГІЇ**

**Formulation of the problem.** With the continuous expansion of the city scale, urban population structure, occupation structure, production and labor of residents, cultural customs and other tests of sports governance ability and service level, has become an important factor affecting the effectiveness of sports governance. Sports ecology refers to sports activities in which sports, culture and ecological environment coordinate, care for each other, co-exist, integrate and develop together. Through sports to advocate a healthy, civilized and harmonious way of life, so as to maintain the harmony and development of the world. Urban population refers to the population that has a close relationship with the activities of the city, living in the scope of the city all year round and constituting the social subject of the city. On May 11, 2021, China's seventh national census data showed that the population living in urban areas was 901.99 million, accounting for 63.89%; The population living in rural areas was 509.79 million, accounting for 36.11 percent. Compared with 2010, the urban population increased by 236.42 million, the rural population decreased by 164.36 million, and the proportion of urban population increased by 14.21 percentage points. In order to further promote the rational distribution of urban population in China, improve the carrying capacity of cities, and promote the sustainable development of population, resources and sports environment, based on the social governance theory,

the macro design of the modernization of China's urban sports governance system and sports governance capacity is carried out. World Cities Report 2020: The Value of Sustainable Urbanisation points out that, despite the impact of the pandemic on the global urban system, urbanisation remains a major driver of global growth and cities can still achieve sustained economic growth and higher productivity levels.

The sports ecosystem has evolved into a community model, cultural framework and research impact indicator that can provide outputs with a high degree of confidence as well as quantitative and qualitative social, cultural and economic data results. From the perspective of urban management, the difficulty of urban management increases geometrically when the urban population increases to a certain scale. From the experience of urban development in the world, the acceleration of population gathering will lead to problems such as imperfect transportation, environment and living facilities, low livable level and poor quality of life, and shortage of public service facilities such as education and medical care. In recent years, China's Engel coefficient has continued to decline, from 30.1% in 2016 to 28.2% in 2019. As a whole, it is close to the inflection point of Kuznets curve, and most eastern cities have been located on the right side of Kuznets curve. In the post-epidemic era, structural problems such as urban population health, aging population, floating population and talents pose new challenges to the functional layout of urban population, and urban residents' demands for happiness and satisfaction in open Spaces such as green Spaces, squares, parks and suburban recreation places have increased. It is clearly proposed in the "Healthy China 2030" planning outline that by 2030, 15-minute fitness circle coverage will be achieved in urban communities, and the per capita sports venue area will be no less than 2.30m<sup>2</sup>. Through research and reveal the urban population distribution structure in the form of direct or indirect role in undertakings of physical culture and sports, clear the dependence of social structure and the ecological environment of sports population, in order to realize China's urban population structure and the coordinated development of the sports activities, build the supply and demand matching "follow rationality and physical

property, balance the deposit and coexistence" system of community sports facilities configuration and optimization, We will promote high-quality urban development.

**Analysis of recent research and publications.** Certain aspects of sports management and its development and its impact on ecology in conditions of high population concentration have been studied by such researchers: V.P. Kucheryavy, A.V. Stepanenko, F.V. Stolberg, V.V. Denisov, A.P. Voytsitskyi, Vladimirov V.V., Likhocheva E.A., Reimers N.F., Douglas I., Shi S., Guang Y., Ge S., Han L., and others. The problems of urban ecosystems taking into account the sports component under the influence of synergistic processes only intensified and became more complicated over time, so effective ways of overcoming them became the object of research by a number of international and domestic scientists. Despite the sufficient number of publications, issues related to the improvement of the sports management system taking into account the environmental component have not been fully investigated.

**The purpose of the article** – the purpose of the study is a comprehensive analysis of the management of the location of the urban population, taking into account sports ecology, the formation of scientifically based proposals and recommendations regarding the construction of a model of the location of the urban population.

When writing the scientific article, we used the following research methods, namely: the method of analysis and synthesis - when researching the opinion of scientists regarding the model of managing the location of the urban population; the method of economic and statistical analysis and comparison - when calculating indicators of territorial location; method of generalization - when forming scientifically based proposals and recommendations regarding the conducted research.

**Presenting main material.** Lewis, an American development economist, pointed out that industrialization drives urbanization and urbanization drives industrialization, and the world economy gradually changes from urban-rural dual structure to modernization structure. Gottman pointed out the spatial phenomenon that rural areas and big cities in suburban areas of the United States and the world are

interdependent, and land and other living and production resources are comprehensively utilized. Rehfeld et al. (2017) believes that sports activities should not only follow natural laws, but also maintain harmony with the natural environment and give play to the subjective initiative of urban population. Urban social environment determines the development of sports, and population environment is an important factor[5].

China's urban population management has changed from relying on administrative means to a comprehensive response and meet their needs of the main city. After the reform and opening up, population governance has changed from governing according to people to governing for the people. Important article xi Jinping, general secretary of the national medium and long-term economic and social development strategy a number of major issues "mentioned two" objective laws ", "enhance the advantage of regional economic development, such as the central city and urban agglomeration economy and population carrying capacity, this is in accordance with objective laws", and "industrial and population concentration to advantage area is the objective economic law". Shi S. (2017) believes that ecological civilization and urban leisure sports development are an interactive process, and urban leisure sports is a systematic engineering of the urban system consisting of three subsystems and operation systems of supply, demand and environment[7]. Ge S (2016) believes that by opening school sports facilities, citizens can go to nearby schools to use sports facilities and ensure their integrity[2]. The construction of Chinese model urban governance system puts forward the concept of "community of life" integrating society, community and residents, emphasizing residents' community contribution, community participation and community identity, and advocating community sharing, co-governance and win-win. Livesley (2016), Shi S.X. (2017), Guang Y (2016) et al believed that the health of urban residents cannot be separated from physical exercise, and physical exercise cannot be separated from a good ecological environment of sports. People have higher demands for health, and the fitness activities of urban residents constantly affect the ecological environment of

sports. New changes have taken place, and a good sports ecological environment emerges at the historic moment[2, 4, 7].

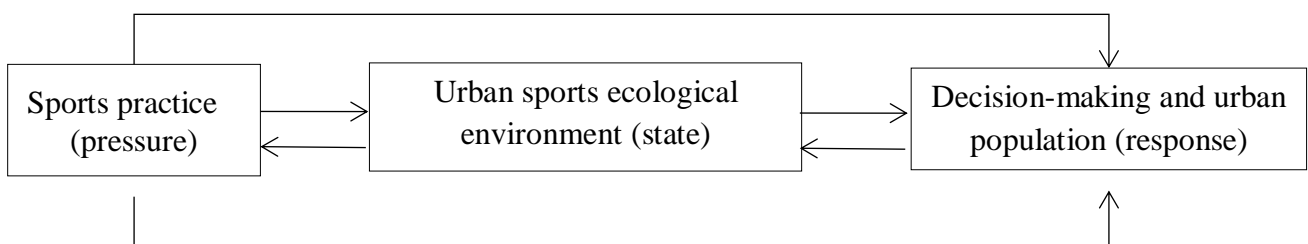
In 2020, Henan province will have 99.366,000 permanent residents, accounting for 7% of the national population. From 2010 to 2020, the total resident population of the province increased by 5.35 million, with an annual growth rate of 0.55%, ranking the third in China and the first in central Provinces. In 2020, there will be 55,077,600 permanent urban residents, with the urbanization rate reaching 55.43%. From 2010 to 2020, the urbanization rate of permanent urban residents will increase by 16.91 percentage points, with an average annual growth rate of 1.69 percentage points, showing a trend of accelerated development. The 2018 Revision of World Urbanization Prospects released by the United Nations predicts that the Urbanization rate in the developed regions of the World will rise slowly from 78.7% to 86.6% from 2018 to 2050. The urbanization rate of less developed regions will increase from 50.6% to 65.6%. Developing countries will be the main place of global urbanization in the next 30 years, mainly concentrated in Asian and African countries. China's urbanization process is slightly higher than the average level of global developing countries. "Imbalance and inadequacy" is not only a problem facing Our country at present, but also a global problem. Globalization and the development of knowledge economy have intensified the polarization effect and the imbalance of regional development. The comprehensive carrying capacity of cities in Henan province is not strong, and the land carrying load is high. 1.74% of the country's land carries 7.8% of the country's population, 6% of the country's arable land produces 10% of the country's grain, and the per capita arable land area is 87% of the national average. The overall education level of the labor force in the province is low, the shortage of high-quality talents is prominent, and the province's ability to attract talents is insufficient. In building cities, we need to pay more attention to livable, resilient, sophisticated, smart, green and low-carbon cities, and enhance our capacity for all-process, all-weather urban governance, so that our people can live a better life with greater dignity and happiness. In terms of public services, we will upgrade and build supporting municipal facilities and public services for the elderly, childcare, cultural

and sports facilities in light of local conditions, and build 15-minute sports circles in urban communities to improve the supply of quality public services. Adhere to the priority of sports ecology and green development, and thoroughly implement the major national strategy of ecological protection and high-quality development in the Yellow River Basin. In recent years, Henan province has attached great importance to the construction of ecological environment. The beautiful natural environment, parks and gymnasiums with fresh air provide a good environment for urban residents to take exercise, arouse their enthusiasm for exercise, and establish the concept of environmental awareness and physical health.

When the global epidemic is raging, the data analysis and information interaction based on big data of mobile Internet, especially the link between space and data, are playing an increasingly important role in the ecological management of urban sports. The identification and inversion of people migration based on LBS big data, with the help of personal location service (LBS) data obtained from mobile phones and other personal mobile communication devices being highly popular at present, can identify and track the previous spatial sports activity track of individual citizens in time and space with high precision, and construct a THREE-DIMENSIONAL digital map of the city. Urban spatial data, LBS data and sports activity data are summarized to provide basis for the decision of urban population layout under sports ecology. Artificial intelligence (AI) technology is used to make intelligent prediction of urban sports ecological model and system, automatically mine AI system from online content such as Weibo, help relevant experts to identify possible and potential situations, model the situation of urban sports ecology, and obtain crowd sports activity picture information of various communities in the city from LBS data. It can evaluate the balance of supply and demand of sports resources in different communities and improve the allocation of sports facilities in community planning. Encourage open communities, integrate communities and basic living circles, effectively solve the link between sports ecological environment and life security, and strengthen community unmanned management system.



New era, the construction of ecological civilization and people more and more livable environment, green space, square, park, urban outskirts' recreation places open space such as an important carrier of modern residents physical and mental health, the city must be formed in the internal rational allocation of population and industry layout, with interaction of supply and demand to promote balanced development of city, improve the utilization efficiency of urban resources, To speed up the urban land, population, capital and technology, data and other traditional elements such as the new elements to fully mix, give priority to with domestic large cycle, reconstruct regional industrial chain, fully elaborating management innovation method and diversified means of governance, to improve the government's ruling ability, guarantee the socialization of urban governance, the rule of law, intelligent and professional level, to ensure the safety of urban development. The spatial layout of large-scale stadiums should be conducive to the holding of large-scale sports events, and more importantly, it should optimize the geographical spatial structure of cities to meet the diverse needs of urban people. May also pointed out that the impact of sports events on the environment of the host place is long-term and the amount of change is difficult to measure[1]. In the construction and development of sports tourism model in the future, people will pay more attention to the green concept of sports and tourism industry, and combine sports industry, tourism industry, ecological environment construction and environmental protection cause. Sports humanistic environment influences various social cultures of sports subjects. Open cultural vision, optimistic and enterprising attitude, clear and healthy personality, profound cultural sense, strong sense of belonging and social responsibility affect the development of physical and mental health of urban residents.



Picture - 1. Construction of sports ecological city system evaluation system

PSR model uses the thinking logic of "pressure-state-response" to reflect the interaction between human beings and the environment. In terms of sports ecological environment system, the United Nations Environment Programme (UNEP) and ORGANIZATION for Economic Cooperation and Development (OECD) pressure-state-response (PSR) model is taken as the framework of system design (as shown in the figure). This model follows the idea of "cause-effect - response". Due to its tight logic and strong realistic correlation in relevant theories and empirical studies, this model can comprehensively reflect the causal relationship between natural environment, economy, resources and other factors in the ecosystem, and react through decisions and behaviors. Promote the development of benign cycle of urban ecological environment system [6]. (1) Pressure, reflecting the level of ecological environment construction caused by urban population sports activities; Rate of development of natural resources and consumption per unit of GDP. The number of urban population and population density reflect the distribution of urban population and the population pressure on land. (2) in terms of state, per capita sports facility area and coverage of sports environment resources; Utilization rate of sports venues. (3) In response, resource utilization reflects the control degree of sport ecology on urban population activities; The proportion of environmental protection investment in GDP, natural resource protection planning and score reflect the government's response to improve the quality of sports ecological environment.

According to the relationship between natural environment and urban residents' fitness activities, social environment and urban residents' fitness activities, the ecological environment layout management model of urban residents' fitness sports is established. The method of subsection sample test was used to realize the coordinated development of residents, ecological environment and fitness, and to extract the fitness information of urban residents  $v_i(x)$ , The feature decomposition of urban residents' fitness information was carried out  $\nabla^2 v_i(x)$ , The ecological environment layout governance model was designed to enhance the benefit of residents' fitness and ecological environment layout governance  $s(x)$ :

$$S(x) = \sum_{i=1}^N v_i(x) \nabla^2 v_i(x) \quad (1)$$

In the middle, aiming at the fuzzy correlation characteristic points of residents' fitness and ecological environment layout planning, the paper analyzes and realizes the construction of residents' fitness sports ecological environment layout governance model.

Table 1

Residents' fitness information

	2014 y	2015 y	2016 y	2017 y	2018 y	2019 y	2020 y	2020 y to 2014 y, %
Total value of sports Industry (100 million YUAN)	2034,9	2564,3	2849,7	3296,0	177171,4	4419,5	4103,1	201,6
Proportion of added value of sports Industry in GDP (%)	0,6	0,8	0,9	0,9	1,1	1,1	1,1	165,6
Total output value of Sports Service Industry/Total Value of Sports Industry (%)	31,1	33,4	35,9	38,7	47,9	50,6	51,6	165,9
Per capita Sports consumption (YUAN)	926,0	1158,0	1448,0	1811,0	2264,0	2927,0	4203,0	453,9
Sports area per capita (m <sup>2</sup> )	1,5	1,6	1,6	1,7	1,9	2,1	2,2	145,7

Source: National Bureau of Statistics

Курс юаня: URL: <https://myfin.by/converter/cny-usd/1>

By the end of 2020, China had 3.713 million sports venues with an area of 3.1 billion square meters, or 2.2 square meters per capita, according to the Sports Blue Book: China's Sports Industry Development Report 2020. The number of social sports instructors in China has reached 2.6 million, with 1.86 social sports instructors per 1,000 people. There are 47,300 sports organizations, and there are three fitness sites for every 10,000 people in urban communities. By the end of 2021, China's per capita sports area will reach 2.41 square meters, and 37.2 percent of the population will regularly take part in physical exercise.

Table 2

## Fitness characteristics of Chinese urban residents

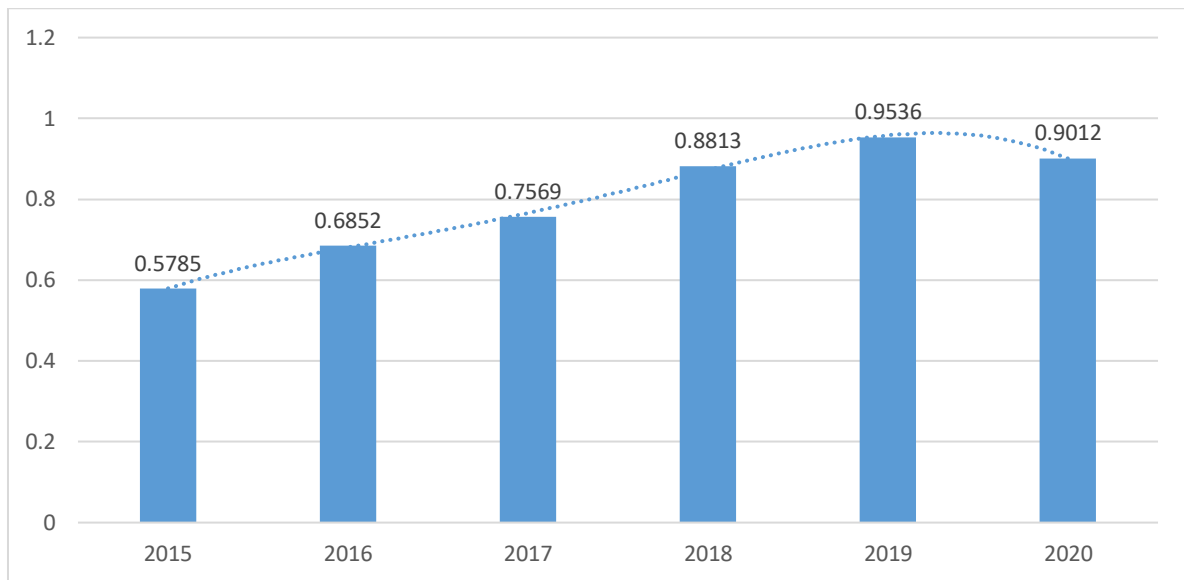
	2014 y	2015 y	2016 y	2017 y	2018 y	2019 y	2020 y	2020 y to 2014 y, %
Per capita GDP (Yuan/person)	47173	50237	54139	60014	66006	70776	72447	153,6
Proportion of urban population (%)	54,8	56,1	57,6	58,5	59,6	60,6	63,9	116,6
Urban population density (people/km <sup>2</sup> )	2419	2399	2408	2477	2546,2	2631	2709,1	112,0
Per capita Park green area (square meters/person)	13,1	13,6	13,7	14	14,1	14,5	14,9	113,7
Number of health technicians per 10,000 population (persons)	56	58	61	65	68	73	80	142,9

Source: National Bureau of Statistics

The NHC held a press conference on July 16, 2021. The health literacy level of Chinese residents reached 23.15 percent in 2020, up 6.09 percentage points from 17.06 percent in 2018 and 3.98 percentage points from 2019, the largest increase in years, according to the press conference. Data show that more than 400 million people regularly participate in physical exercise in China, accounting for 35% of the total number of urban and rural residents to meet the "National physical fitness standards" qualified more than 90% of the number of people.

According to the above conclusions, the coordinated development level of sports ecology and urbanization presents the following characteristics:

- the coordination of China's sports ecosystem and urbanization system presents a relatively rapid growth trend;
- the lag of sports ecology construction is the main factor restricting the coordinated development of sports ecology and urbanization.



Picture – 2. Coordination between sports ecosystem and urbanization population distribution

It is necessary to accelerate the development of urbanization in order to promote the coordinated development of sports ecology and urbanization. The urban population distribution and sports activities in China are as follows: the proportion of people who really like leisure sports is not high, and there is still a gap between urban residents' understanding of leisure sports and their participation in sports; Insufficient and unbalanced supply of sports venues, far from meeting the needs of urban residents, has a certain restriction on sports participation; Urban residents' participation in leisure sports activities presents a spatial circle structure of community sports activities, urban sports activities and urban sports activities. The participation in sports activities is mainly spontaneous, and the strength of sports-related organizations is weak. Sports industry market has huge development space, but it is urgent to form a reasonable layout, perfect functions, complete categories of fitness and leisure industry development pattern, stimulate the potential of sports consumption, optimize the industrial environment, enrich the supply of products and services; Most cities can adopt targeted negotiation adjustment strategies.

The optimization of population function layout in a global perspective must consider the diverse needs of urban population structure for urban space and urban function, and improve the comprehensive carrying capacity of the city. According to

the research on ecological environment layout planning mode of urban residents' fitness sports, the following suggestions are put forward:

Sports ecological construction and urban population distribution is a systematic process, the government needs to have reasonable and scientific planning and design in the early stage, do a good job in the top-level design, improve the overall planning and design, including the determination of the core area of sports, scale and format layout, etc. Improve the urban sports activity mechanism construction and ecological environment protection, enhance the comprehensive carrying capacity of urban population; Speed up legislation to guide the behavior norms of urban population sports activities by law; Improve the urban scale structure and population function layout, organize the balanced development of stadiums and sports administrative organizations, and promote the reconstruction of urban functional division of labor system. Strengthen the awareness of sports environment of urban community residents, strengthen the combination of sports ecology, urban construction and humanity, and build a sustainable urban sports ecology in line with the new era. We will implement targeted and differentiated population function optimization and distribution strategies in light of local conditions, implement a national fitness program, form an urban population layout with distinctive features, strong competition and complementary strategies, guide the increase of sports population, and lead the evolution of China's urbanization pattern to a more advanced and healthier state.

To increase the training of sports workers and the introduction of professional high-level sports management talents, the output of sports work compound talents; Relevant courses should be set up in colleges and universities to encourage excellent college students to participate in the construction of sports ecology, understand advanced development concepts and improve professional management. Population functions of regional spatial organization innovation, with high quality residential suburbanization driving polycentric structure and development of the urban construction is convenient, practical, small, diversified sports venues and public fitness path, scientific and rational use of internal and external space and all kinds of

equipment, construction of parks, sports venues and the urban community development in harmony, constantly raise the level of environmental protection and facility management. In the function configuration, focus on the user in gender, age structure, family structure, occupation and other aspects of the differentiated needs; In terms of service management, we attach importance to the maintenance and protection of grassroots sports facilities, advocate the reconstruction of old communities, and create a friendly community sports facilities environment. To build a workplace and living community with relatively concentrated talents in international cities in line with the world's advanced level.

The government should adhere to the principle of respecting nature, protecting nature and basing itself on nature, adhere to the principle of "resource optimization" and "conservation and environmental protection", and combine with the local traditional sports characteristics to build a "localized" ecological sports environment. We should integrate the construction of sports ecological environment into the ecology, build ecological sports venues that are harmonious with "human, architecture and natural ecological system", improve the utilization rate of venues, optimize the spatial layout of urban "life, production and ecology", and coordinate the development with urban ecology, economy and culture. Promote the two-way opening of school sports venues and social public sports venues to attract the masses to actively participate in sports and cultural activities and construction; Consolidate the foundation of amateur sports; The establishment of the national team sports team grass-roots system. According to the urban structure, scientific layout of urban sports space range and reasonable development of urban sports activities. To push the diversity of urban sports work, through the subject pluralistic, mechanism and way of governance, enlarge the effective supply of urban sports public service, by way of innovation, the way such as precision supply increase sports participation, to solve the problem of imbalance in the structure of sports public services supply, provide power for the construction of ecological civilization in our country.

**Conclusion.** After the outbreak period, sports health ecological environment and the urban population is an important part of the overall ecological environment in our

country, the change of the ecological environment changes of ecological environment in the urban residents' fitness sports city ecological construction optimization needs in sports management service, should put the population density, as an important factor of community scale properties to configure a reasonable number of facilities, We will improve people's quality of life and their sense of benefit and happiness from public sports services. In the development of "innovation, coordination, green, open, sharing" as the concept of guidance, strengthen ecological civilization, to improve the development of urban sports environment; Pay attention to urban planning to optimize the spatial structure of urban sports; Explore the law of development, according to local conditions to develop urban sports undertakings; Promote public management service to solve the contradiction of urban sports development; Adhere to market dominance to enhance the vitality of urban sports development; Encourage social participation to establish an effective mechanism for demand expression. China needs to base itself on the national conditions of sports and urban development in the new era, avoid blindly copying, and accelerate the formation of the theoretical system and practical scheme of sports ecology promoting urban renewal with Chinese characteristics, so as to lay a solid foundation for promoting the modernization of mass sports and urban governance capacity and system in China.

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