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Strategic research on the public service indemnification of the of the construction of chinese citizens sports venues based on honeycomb model

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ABSTRACT

To guarantee the public service of Chinese citizens sports venues, we analyze its indemnification from the perspective of sports service industry. Sports service industry is one of the important branch of sports industry and also an indispensable industry of the national economy. However, the current situation of sports service industry in China is quite negative. Its development is enslaved to the economy. Researches have shown that we have to make more studies on venues and facilities with the honeycomb model and the characteristics of sports public service, highlighting the imbalance between city and countryside and finding out the best covering model. To avoid resources-wasting and enterprises eliminating, we should consider the population density and properly increase the overlap area. In the sparsely-populated and less developed areas, the sports venue should cover more.

KEYWORDS

Honeycomb model; Sports service industry; Sports industry; Sports venues; Mathematics model.

INTRODUCTION

We can't deny that there have been many drawbacks in sports service industry of China, such as a low starting point, an early beginning, imbalanced development, and so on. But in general, it's growing year by year. Different people have different consumption views to sports service industry. The demand to sports service industry is high in developed cities while in the countryside, this demand is lower. If not there will be a waste of energy and an inappropriate arrangement of resources. Moreover, different conceptions to sports service industry is also the one of the constraints to consumption level. Therefore, to sports service industry, the main factor to its distribution is the imbalance of urban and rural economies.

In spite of this imbalance, economy is the base and significant tache of social development. Rural residents know few about physical education and national fitness and this consciousness should be improved. Compared with the advanced venues in the city, the support to the rural ones is much too little. Figure 1 below shows the phenomenon:
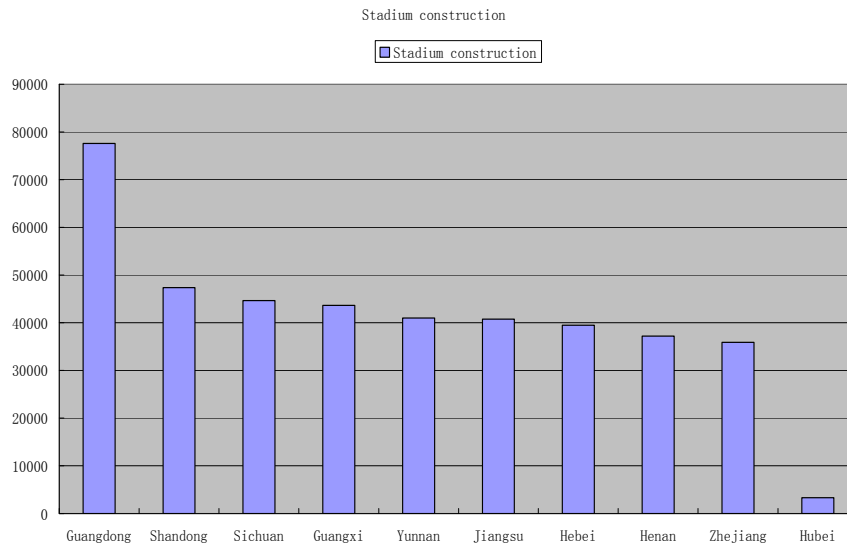

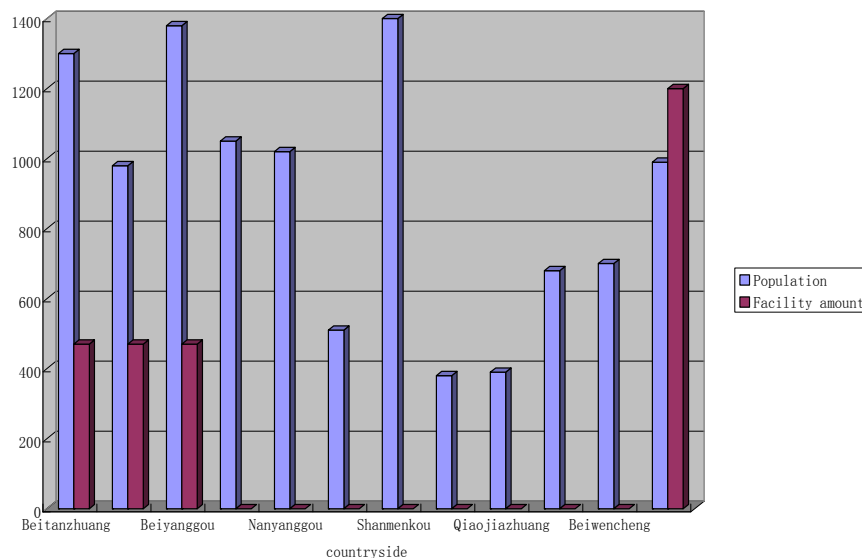**Figure 1 : Sports people groups in different regions**

Figure 2 : Comparison of numbers of rural population and sports facilities

From Figure 1, we can know that because of the rapid urban economic development, sports facilities are set in the residential neighborhoods with a number of advanced venues and clubs in the city.

In spite of the imbalance between urban and rural economies, economy is the base and significant tache of social development. Rural residents know few about physical education and national fitness and this consciousness should be improved. Compared with the advanced venues in the city, the support to the rural ones is much too little. With this, more

good effects can be found in the advanced venues. Figure 2 has indicated the comparison between the numbers of the population and the sports facilities in a village.

ESTABLISHMENT OF THE MODEL

Public administration and government reformation are included in public service. It provide the social economy, politics, and culture with indemnification and convenience. And public service concentrates on its serviceability to guarantee citizens' rights. Also, it has ambiguity and diversity. With the development of economy, all sports service organizations have sprung up. TABLE 1 is the statistical data of the number of the social organizations in China from 1988 to 2009.

TABLE 1 : Quantitative statistics of the number of the social organizations in China from 1988 to 2009

Year	Number	Increasing number in the same period	Growth rate	Year	Number	Increasing number in the same period	Growth rate
1988	446			1999	14265	-22935	-13.85
1989	454	8	2.20	2000	15332	1057	7047
1990	1085	631	139.55	2001	21099	5717	37.58
1991	8214	7159	662.91	2002	24509	3370	15.91
1992	15402	7188	86.57	2003	26612	2203	9.04
1993	16706	1304	8.42	2004	28432	2220	8.56
1994	17460	654	3.91	2005	31962	3431	10.83
1995	18083	653	3.75	2006	35493	3431	9.18
1996	18421	428	2.35	2007	38616	3223	9.18
1997	18118	-353	-1.90	2008	41000	2384	5.97
1998	16600	-1518	-8.67	2009	41360	360	0.89

Since 1993, social service facilities has basically met the requirements, so the growth rates decrease. This suggests that the development of sports industry in China tends to be quite good. From TABLE 2 below we can know the proportions of sports industry in the economy of some provinces in China.

TABLE 2 : Proportion of sports industry in the economy of a province

Province	Guangdong	Jiangsu	Beijing	Liaoning	Zhejiang
Proportion	24%	15%	30%	13%	15%

From TABLE 2 we can notice that sports industry has a high proportion in Guangdong, Jiangsu, Beijing, Liaoning, and Zhejiang, especially in Beijing and Guangdong.

Central place theory

With the central place theory, now we can discuss about the spatial distribution of urban sports facilities (central place). First we have to use the central place model.
In this paper we make the following assumptions:

(1) The central place model, which is about the sports service the place can supply, should be established in the densely-populated center.

(2) To be convenient and serve the small users, lower sports central places can cover less area.

(3) The quantities of higher sports central places are more and the areas are larger with a lager involving scope.

Based on central place theory, the densely-populated cities and the sparsely-populated countryside can relatively choose the preponderant location to save some resources.

Honeycomb model

We just think about how to let the small circles cover the big circles to make least small circles. We assumes that users is distributed uniformly and won't be influenced by terrain, landform, and climate changes. In the aspect of sports

service population, the covering are is a circle. If the radius r is the same, we can calculate the adjacent regions distances, region areas, and width and area of the crossover region of the neighborhoods with three kinds of shapes, like in TABLE 3:

TABLE 3 : Comparison of the three shapes

Shape	Regular Triangle	Square	Regular Hexagon
Adjacent Regions Distance	r	$\sqrt{2}r$	$\sqrt{3}r$
Region Area	$1.3r^2$	$2r^2$	$2.6r^2$
Crossover Region Width	r	$0.59r$	$0.27r$
Crossover Region Area	$1.2\pi r^2$	$0.73\pi r^2$	$0.35\pi r^2$

From TABLE 3, we can know that regular hexagon is the most proximate to circle. It can effectively satisfy the covering area and is the most reasonable one. Thus, we place a regular hexagon in the center of the honeycomb model and expand it outwards. The process is like Figure 3 and we can get the relation between the diameter d and the quantity N:
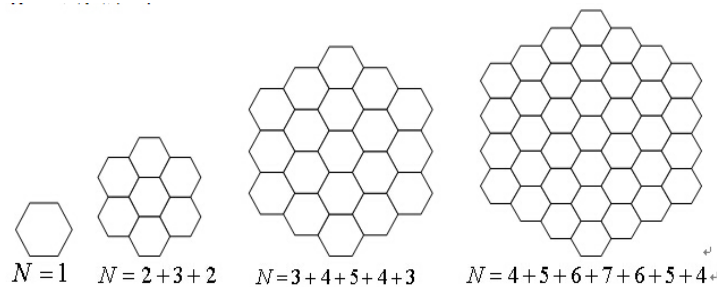

$N=1$ $N=2+3+2$ $N=3+4+5+4+3$ $N=4+5+6+7+6+5+4$
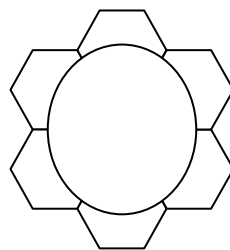
Figure 3 : Honeycomb structure

Figure 4 : The boundary of the circle locates in the centers of the hexagons of the outermost layer

In Figure 4, the boundary of the circle locates in the centers of the hexagons of the outermost layer. By rules we can get: $N = 12n^2 + 30n + 19$. N Is the numbers of hexagons that need to overspread the circle.

As for $n : n = \dfrac{D}{d}$. D is the diameter of the circle and d is the diameter of the inscribed circle of the hexagon.

We assume that in the area of a circle whose radius is 40 miles, the least number of venues are running at the same time. Each venue has its own covering area. And the area changes as the population density. To get the best covering effect, the overlap areas of every two adjacent venues should be the least. In this paper, we have make a chart for this statistics:

We should think about the population density because of the covering area of the venue and the overlap areas. As population in city is dense, though a stadium can meet the demand of sports public service in a certain area, citizens in this area can't enjoy the service freely. As a result, overlap areas should be added. The same is that in those where the population is sparse, the covering area should be more, or it will be resources-wasted and corporates-eliminated.

We should completely consider the different development level of urban and rural economies, and with the basic of nationwide fitness program, select the suitable public sports facilities which meet the requirements of development. Other factors include land utilization, construction cost, facilities cost, people's physical conditions, economic growth, urban planning, and convenience.

TABLE 4 : Statistical table

Numbers of sports facility or venues N	Covering radius r	Numbers of sports facility or venues N	Covering radius r
1	40	1261	1.859
7	20	1387	1.818
19	11.09	1519	1.701
37	8	1657	1.667
61	7.184	1801	1.568
91	6.667	1951	1.538
127	5.298	2107	1.454
169	5	2269	1.428
217	4.193	2437	1.355
271	4	2611	1.333
331	3.468	2791	1.269
397	3.333	2977	1.25
469	2.957	3169	1.194
547	2.857	3367	1.176
631	2.577	3571	1.126
721	2.5	3781	1.111
817	2.283	3997	1.066
919	2.222	4219	1.053
1027	2.049	4447	1.012
1141	2	4681	1

CONCLUSION

To sports service industry, the main factor to its distribution is the imbalance of urban and rural economies. In this paper, we will figure out the developing strategy of sports service industry in rural areas based on analytical hierarchy process model. Economy is the base and significant tache of social development. Rural residents know few about physical education and national fitness and this consciousness should be improved. Compared with the advanced venues in the city, the support to the rural ones is much too little. We should run the least numbers of venues at the same time to serve the users. Each venue has its own covering area, and the area changes as the population density. Finally we can get the best consequence.

ACKNOWLEDGMENT

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