ISSN : 0974 - 7435 Volume 10 Issue 15

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(15), 2014 [8315-8322]

China rural sports basic public services supply mechanism innovation research in the background of new pattern urbanization

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ABSTRACT

For Chinese sports service industry, urban and rural economic development imbalance is up to sports service industry distribution important factors. The paper bases on analytic hierarchy process model to carry on sports service industry development strategic research on rural areas. Due to economic development ratio is not very balanced, and economy is an important link and more a base of social development; rural residents still know little about real physical education and national fitness significances, national fitness consciousness is still to be improved; support on rural sports is not big enough, by contrast, urban advanced stadium has good effects. For China rural sports development status analysis, it gets that China rural sports basic public services facilities evaluation obtained proportions in gym, sports facilities, common sports development are respectively 0.294%, 0.462%, 0.344%. Result analysis concludes that for new pattern urban construction, sports facilities occupy the larger proportion.

KEYWORDS

New pattern urbanization; Rural sports basic public services; AHP.

INTRODUCTION

Due to China has gone through different stages' rural development, as people's commune movement and so on, because rural areas have important positions in China, and government is main supply party of rural sports basic public services facilities. In recent years, due to released all kinds of national policies, include city leads countryside, balance urban and rural economy development and so on, which lets China rural sports basic public services facilities also to be rapidly developed.

Basic public service includes public administration and government reformation, which provides guarantee and convenience for social economic, political and cultural construction, from which basic public services are service-based, guarantee civil right. Basic public services have fuzziness and diversity d, with development of China economy, every sports service organizations also greatly spring up.

MODEL ESTABLISHMENT

Due to sports basic public services facilities coverable regions and overlapping areas should consider population density extent, due to city population is quite concentrated, though a basic public service facility or sports facilities group can meet certain regions sports basic public service requirements, they cannot let the regions' citizen to free and smoothly share sports basic public services, therefore, it should consider population density extent, properly increase overlapping areas, similarly, for population sparsely or economic relative backward regions, sports basic public service facility coverage should increase, otherwise it will cause resources wastes and enterprise elimination status. The paper mainly targeted at rural whole-people sports development status to analyze and establish weight analysis model.

Establish hierarchical structure

Establish target layer, criterion layer, scheme layer relations.

(1)Target layer: Urban sports evaluation.

(2)Criterion layer: c_1 is service number 、c_2 is soundness policies 、c_3 is owned resource quantity 、c_4 is economic influence.

(3)Scheme layer:gym, sports facilities, common development.

Take TABLE 1 showed 1~9 scale table as evidence, it makes weight analysis.

TABLE 1 : 1-9 scale table

Scale a_{ij}	Definition
1	factor i and factor j have equal importance
3	factor i is slightly more important than factor j
5	factor i is relative more important than factor j
7	factor i is extremely more important than factor j
9	factor i is absolute more important than factor j
2,4,6,8	Indicates middle state corresponding scale value of above judgments
Reciprocal	If factor i and factor j are relative weak, obtained judgment is reciprocal

At first, solve judgment matrix, according to above principle, reference 1～9 scale setting, and according to experts experiences and refer to lots of documents, it gets paired comparison matrix in four criterions that are respective as TABLE2-3.

TABLE 2 : Comparison matrix

G	c_1	c_2	c_3	c_4
c_1	1	8	5	3
c_2	1/8	1	1/2	1/6
c_3	1/5	2	1	1/3
c_4	1/3	6	3	1

TABLE 3 : Comparison matrix

c_1	A_1	A_2	A_3	c_2	A_1	A_2	A_3
A_1	1	5	1/5	A_1	1	3	3
A_2	1/5	1	1/5	A_2	1/3	1	3
A_3	5	5	1	A_3	1/3	1/3	1
c_2	A_1	A_2	A_3	c_4	A_1	A_2	A_3
A_1	1	3	3	A_1	1	1/5	1/8
A_2	1/3	1	3	A_2	5	1	1/3
A_3	1/3	1/3	1	A_3	8	3	1

Consistency test

Use consistency indicator to test：

Set in comparison matrix, $\lambda_{\max}$ is maximum feature value, n is comparison matrix order:

$$CI = \frac{\lambda_{\max} - n}{n-1}$$

CI Value gets smaller; Judgment matrix gets closer to completely consistent. CI gets bigger, then it shows that known degree is lower.

$$A = \begin{Bmatrix} 1 & 8 & 5 & 3 \\ 1/8 & 1 & 1/2 & 1/6 \\ 1/5 & 2 & 1 & 1/3 \\ 1/3 & 6 & 3 & 1 \end{Bmatrix}$$

It gets

$$\begin{Bmatrix} 0.557 \\ 0.156 \\ 0.068 \\ 0.234 \end{Bmatrix} = W^{(0)}$$

$$AW^{(0)} = \begin{Bmatrix} 1 & 8 & 5 & 5 \\ 1/8 & 1 & 1/2 & 1/6 \\ 1/5 & 2 & 1 & 1/3 \\ 1/3 & 6 & 3 & 1 \end{Bmatrix} \begin{Bmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{Bmatrix} = \begin{Bmatrix} 2.554 \\ 0.225 \\ 0.422 \\ 1.110 \end{Bmatrix}$$

$$\lambda_{\max}^{(0)} = \frac{1}{4}\left(\frac{2.354}{0.567} + \frac{0.225}{0.056} + \frac{0.422}{0.104} + \frac{1.110}{0.273}\right) = 4.073$$

$$w^{(0)} = \begin{pmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{pmatrix}$$

Similarly, it can calculate judgment matrix

$$B_1 = \begin{Bmatrix} 1 & 5 & 1/5 \\ 1/5 & 1 & 1/5 \\ 5 & 5 & 1 \end{Bmatrix}, B_2 = \begin{Bmatrix} 1 & 3 & 3 \\ 1/3 & 1 & 3 \\ 1/3 & 1/3 & 1 \end{Bmatrix}, B_3 = \begin{Bmatrix} 1 & 5 & 3 \\ 1/5 & 1 & 3 \\ 1/3 & 1/3 & 1 \end{Bmatrix}, B_4 = \begin{Bmatrix} 1 & 1/5 & 1/8 \\ 5 & 1 & 1/3 \\ 8 & 3 & 1 \end{Bmatrix}$$

Therefore, it gets maximum feature value and feature vector as following ：

$$\lambda^{(1)}{}_{\max} = 3.31, \omega^{(1)}{}_1 = \begin{Bmatrix} 0.252 \\ 0.089 \\ 0.66 \end{Bmatrix} \quad \lambda^{(2)}{}_{\max} = 3.12, \omega^{(1)}{}_2 = \begin{Bmatrix} 0.575 \\ 0.286 \\ 0.139 \end{Bmatrix}$$

$$\lambda^{(3)}{}_{\max} = 3.30, \omega^{(1)}{}_3 = \begin{Bmatrix} 0.624 \\ 0.240 \\ 0.136 \end{Bmatrix} \quad \lambda^{(4)}{}_{\max} = 4.05, \omega^{(1)}{}_4 = \begin{Bmatrix} 0.185 \\ 0.240 \\ 0.575 \end{Bmatrix}$$

Use consistency indicator to test： $CI = \frac{\lambda_{\max} - n}{n-1}$， $CR = \frac{CI}{RI}$

(1) For judgment matrix A， $\lambda^{(0)}{}_{\max} = 4.073, RI = 0.9$

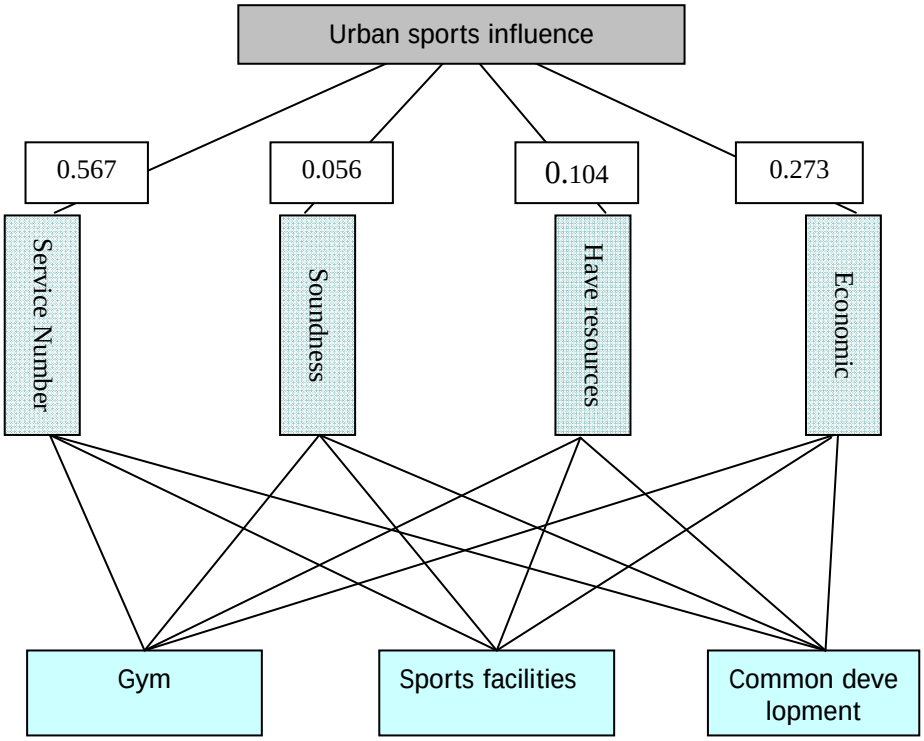
$$CI = \frac{4.073 - 4}{4 - 1} = 0.24$$

$$CR = \frac{CI}{RI} = \frac{0.024}{0.90} = 0.027 < 0.1$$

It shows A inconsistency extent is lower and within permissible range of table.

(2) Similarly, to judgment matrix B_1， B_2， B_3， B_4, it carries out consistency test, and get weight vector.

Utilize hierarchical chart drawing out calculation results from object layer to project layer：



$$\begin{Bmatrix} 0.23 \\ 0.079 \\ 0.85 \end{Bmatrix}, \begin{Bmatrix} 0.365 \\ 0.296 \\ 0.136 \end{Bmatrix}, \begin{Bmatrix} 0.624 \\ 0.256 \\ 0.136 \end{Bmatrix}, \begin{Bmatrix} 0.175 \\ 0.340 \\ 0.575 \end{Bmatrix}$$

Figure 1: Hierarchical structure chart

Calculation result is as following:

$$\omega^{(1)} = (\omega_1^{(1)}, \omega_2^{(1)}, \omega_3^{(1)}, \omega_3^{(1)})$$

$$= \begin{Bmatrix} 0.624 & 0.185 & 0.252 & 0.575 \\ 0.234 & 0.240 & 0.089 & 0.286 \\ 0.136 & 0.575 & 0.66 & 0.139 \end{Bmatrix}$$

$$w = w^{(1)} w^{(0)}$$

$$= \begin{Bmatrix} 0.252 & 0.575 & 0.624 & 0.185 \\ 0.089 & 0.286 & 0.240 & 0.240 \\ 0.66 & 0.139 & 0.136 & 0.575 \end{Bmatrix} \begin{Bmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{Bmatrix}$$

$$= \begin{Bmatrix} 0.294 \\ 0.462 \\ 0.344 \end{Bmatrix}$$

For China rural sports development status analysis, it gets that China rural sports basic public services facilities evaluation obtained proportions in gym, sports facilities, common sports development are respectively 0.294%, 0.462%, 0.344%. Result analysis concludes that for new pattern urban construction, sports facilities occupy the larger proportion.

Basic public service facilities status analysis

As TABLE 4, it shows year 1988-2009 China social organizations amount statistics.

TABLE 4 : Year 1988-2009 China sports service organizations amount statistical table

Year	Amount	Growth quantity in the same periods	Growth rate	Year	Amount	Growth quantity in the same periods	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

From 1993 to now, social service facilities basically meet current demands, therefore growth rate reduces. It indicates China sports industries development have had good trends in recent years, by TABLE 2, it is clear that China some cities sports industry and the cities' economic total quantity proportions.

Central place theory application in rural basic public service facilities

When applies central place theory into discussing urban sports facilities (in the following it calls sports central place for short) space layout, at first it will use central place model.

According to following rules, look for central place; let it to become sports basic public undertakings central point:

1) Central place model has discussed central place provided sports services, and it establishes in the center of dense population;
2) Low level sports central place can reduce sports land, convenient and efficient, it is proper for small size user;
3) High level sports central place quantities are fewer, and covers large areas, available design range is wide.

Based on central place theory, it selects advantageous geographic position in population density cities or rural scattered regions so as to arrive at advantages of saving resources.

Honeycomb model

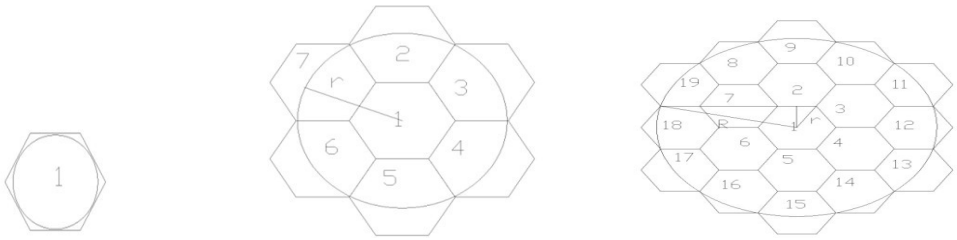
We only need to consider how to use small round to cover big round and let small round quantity to be minimum, assume all residents are balanced distributed in round regions, and don't suffer landform, geomorphology, climate changes

and other factors influences; Sports service needy, in view of number of people, due to coverage region is a round. On the condition that radiation radius r is the same, calculate three shapes housing estates neighboring region distances, housing estate area, crossover region width and crossover region area as TABLE 5 show.

TABLE 5 : Three kinds of graphs comparison

Housing estate shape	Regular triangle	Square	Regular Hexagon
Neighboring region distances	r	$\sqrt{2}r$	$\sqrt{3}r$
Housing estate 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 5, it is clear that regular hexagon shape is the nearest ideal round, it can effective meet cover region, which is most proper, so that takes regular hexagon center as honeycomb structure, extends outside, it process as following show:



Among them, we can find diameter d and number N relationships:

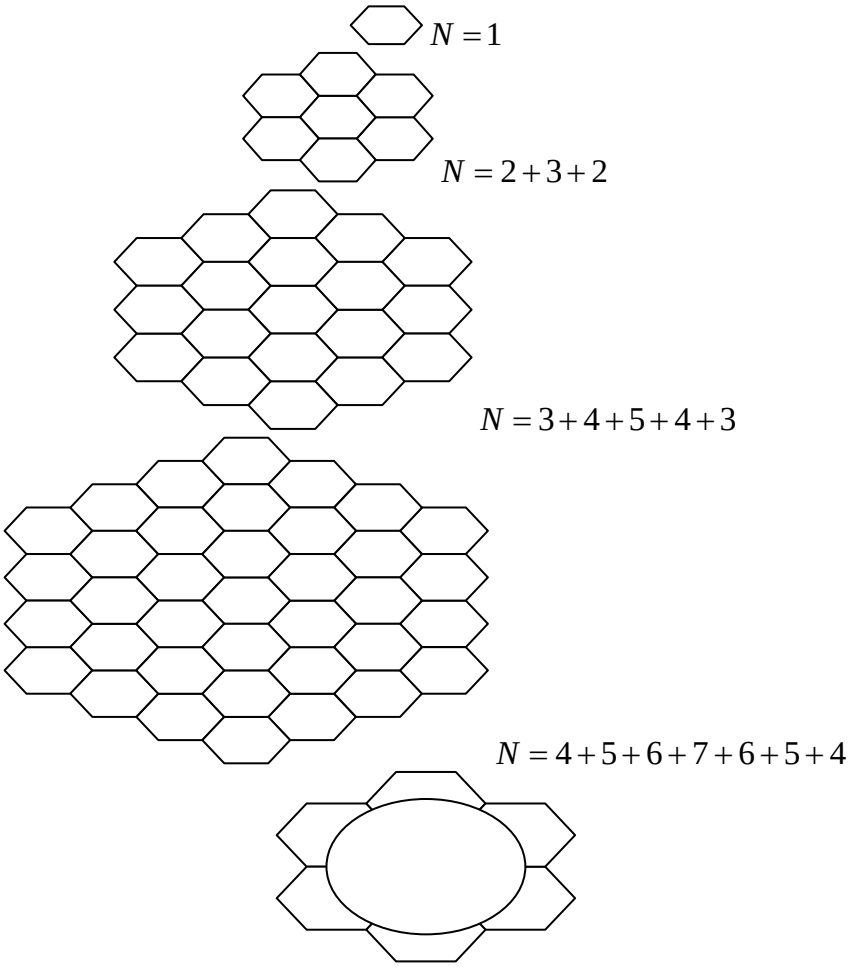


Figure 1 : Round region border lies in outermost hexagon

As Figure 1 show, round region border lies in the outermost layer hexagon center, it can get by rules that:

$$N = 12n^2 + 30n + 19$$

Among them, N is overspread round region required numbers of hexagons. n is equal to

$$n = \frac{D}{d}$$

Among them, D is round region diameter, d is hexagon inscribed circle diameter.

Assume in round region with radius as 40 miles, use least quantity of sports basic public services facilities to accommodate users and meanwhile operate. Every sports facility group contains a fixed coverage range, and sports basic public service facility coverage range will change followed by number of people density extent changes, to get optimal coverage result, it should arrive at every adjacent two sports basic sports service facilities coverage ranges to achieve minimum overlapping area. The paper makes statistics of these data into table, as TABLE 6 shows.

TABLE 6 : Statistical table

Number of sports facilities or basic public service facilities N	Coverage radius r	Number of sports facilities or basic public service facilities N	Coverage 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

Practical consider urban and rural economic development extent, based on whole-people fitness features, consider urban and rural development differences in land utilization, construction expense, equipment expense, people physique strengthening, economic growth, city planning, convenience extent and other aspects, select suitable urban and rural development sports public facilities types.

CONCLUSION

China rural sports basic public services facilities evaluation obtained proportions in gym, sports facilities, common sports development are respectively 0.294%,0.462%,0.344%. Result analysis concludes that for new pattern urban construction, sports facilities occupy the larger proportion.

The paper uses least quantity of sports basic public services facilities to accommodate users and meanwhile operate. Every sports facility group contains a fixed coverage range, and sports basic public service facility coverage range will change followed by number of people density extent changes, and gets optimal coverage result.

ACKNOWLEDGMENT

Social science planning in Jiangxi. Jiangxi Rural Health Service System Research.

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