

Analysis and forecasting of sacral tourism potential of Kazakhstan with the time series analysis

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Abstract

The aim of this study is to investigate the effect of tourist resources, conditions and opportunities of sacral tourism in Kazakhstan using panel data (time series and cross-sectional) regression analysis for a sample of 14 regions of Kazakhstan observations over the period from 2004 to 2022. The main focus is on the method of estimating the size and effectiveness of the tourist potential, which reflects the realization and volume of tourist resources and its potential.

KEYWORDS

sacral tourism; sacred objects; cultural tourism; estimation methodology; tourism infrastructure; time series analysis; Kazakhstan

Introduction

The present study estimates a total of 731 objects, (table 6) of which 216 sacral objects of national significance and 515 objects of regional significance, which are represented on the map of the location of sacral objects in the territory of Kazakhstan.

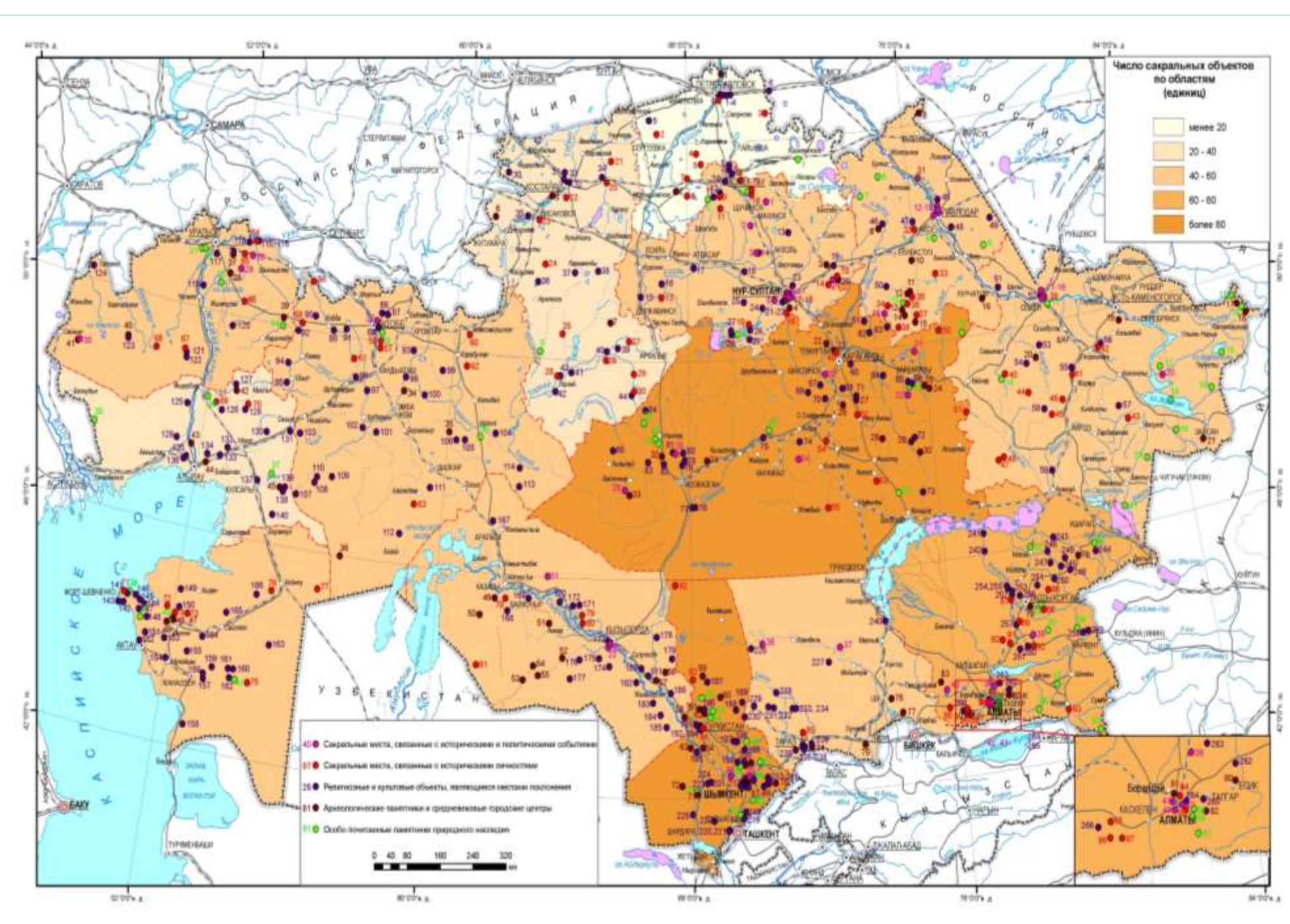


Figure 1. The number of objects of sacred tourism in the CONTEXT of the administrative regions of Kazakhstan

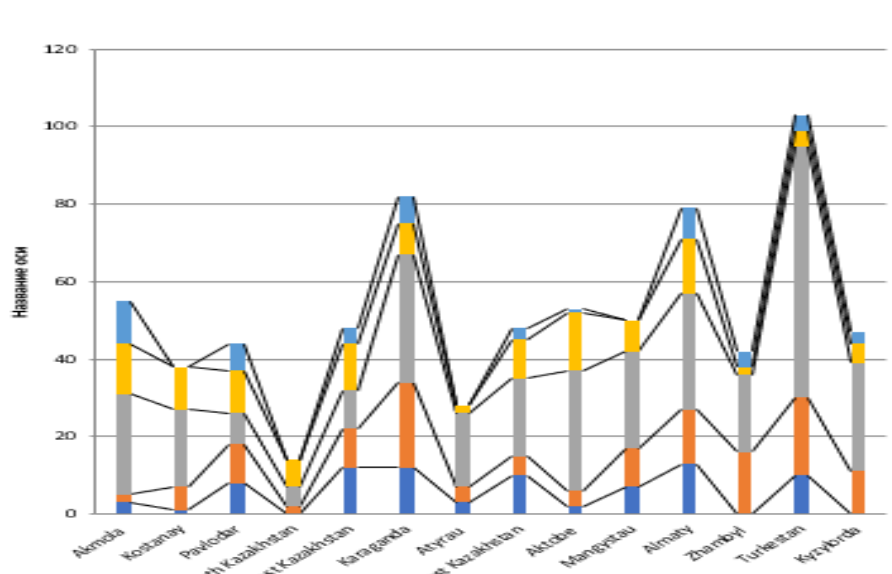


Figure 2. Comparative quantitative characteristics of sacral tourism objects in the context of administrative regions of Kazakhstan

Methods

If data on an indicator are collected at different points in time, it is said that a time series is obtained. Time series analysis is a set of mathematical and statistical methods designed to identify the structure of time series and forecasting. Prediction of future values of time series is used in decision making (Yeliseyeva et al., 2014), (Ebere Ume Kalu, Chinwe Achike, Ann Ogbo and Wilfred Ukpere, 2020). In order to extrapolate the number of tourists served, it is appropriate to use time-series tools, in case trends, seasonal or cyclical components are identified.

Table 7. Statistical data of tourist infrastructure

Parameters	Number of accommodation, units	Average cost of a bed-day, tenge	Number of employees, people	Average monthly salary of employees of travel agencies, tenge	Number of visitors for religious and pilgrimage purposes	Length of paved roads of republican significance, km
Akmola	298	7951	2179	43816	450	7847
Aktobe	103	5636	1073	99658	480	5124
Almaty	531	7900	3288	180148	2363	8828
Atyrau	99	9924	1487	138086	524	2401
East Kazakhstan	550	4918	2443	122163	1869	10367
Zhambyl	187	6006	593	72207	1367	4313
West Kazakhstan	68	6239	727	63242	495	4357
Karaganda	248	8035	1688	63370	5260	8430
Kostanay	140	5088	859	44128	2899	47403
Kyzylorda	109	7792	542	251886	8913	219858
Mangystau	90	10669	1430	98983	1620	2522
Pavlodar	111	6970	935	50189	656	7675
North Kazakhstan	119	5745	498	51697	195	7113
Turkestan	166	5743	571	70663	22280	6555

Tests and graphical interpretation are available to confirm the trend hypothesis. The availability of tourist infrastructure (table 7) includes the following indicators: the number of locations, units; average cost of bed-nights, tenge; number of employees, people; average monthly salary of employees of travel agencies, tenge; number of visitors for religious and pilgrimage purposes; length of roads with hard surface of republican value, km (<https://new.stat.gov.kz>).

Table 8. Visitors served by domestic tourism accommodations (residents) for 2004 - 2022

year	2004	2005	2006	2007
Places of accommodation served visitors, persons	814 534	963 454	1 140 140	1 416 594
year	2008	2009	2010	2011
Places of accommodation served visitors, persons	1 258 065	1 792 504	1 954 707	2 261 529
year	2012	2013	2014	2015
Places of accommodation served visitors, persons	2 507 005	2 721 714	3 125 429	3 110 012
year	2016	2017	2018	2019
Places of accommodation served visitors, persons	3 495 267	4 387 495	4 695 942	5 286 782
year	2020	2021	2022	
Places of accommodation served visitors, persons	3 328 614	5 145 217	6 407 318	

Note. The table is compiled by the authors according to <https://new.stat.gov.kz/>

The time series in table 8 shows an increasing trend, except for 2020. In 2020, the coronavirus epidemic peaked in Kazakhstan, which caused a sharp decrease in the number of displacements both in our country and in all countries of the world.

Despite the decline in 2020 data, domestic tourism statistics show a clear upward trend, as illustrated in figure 3.

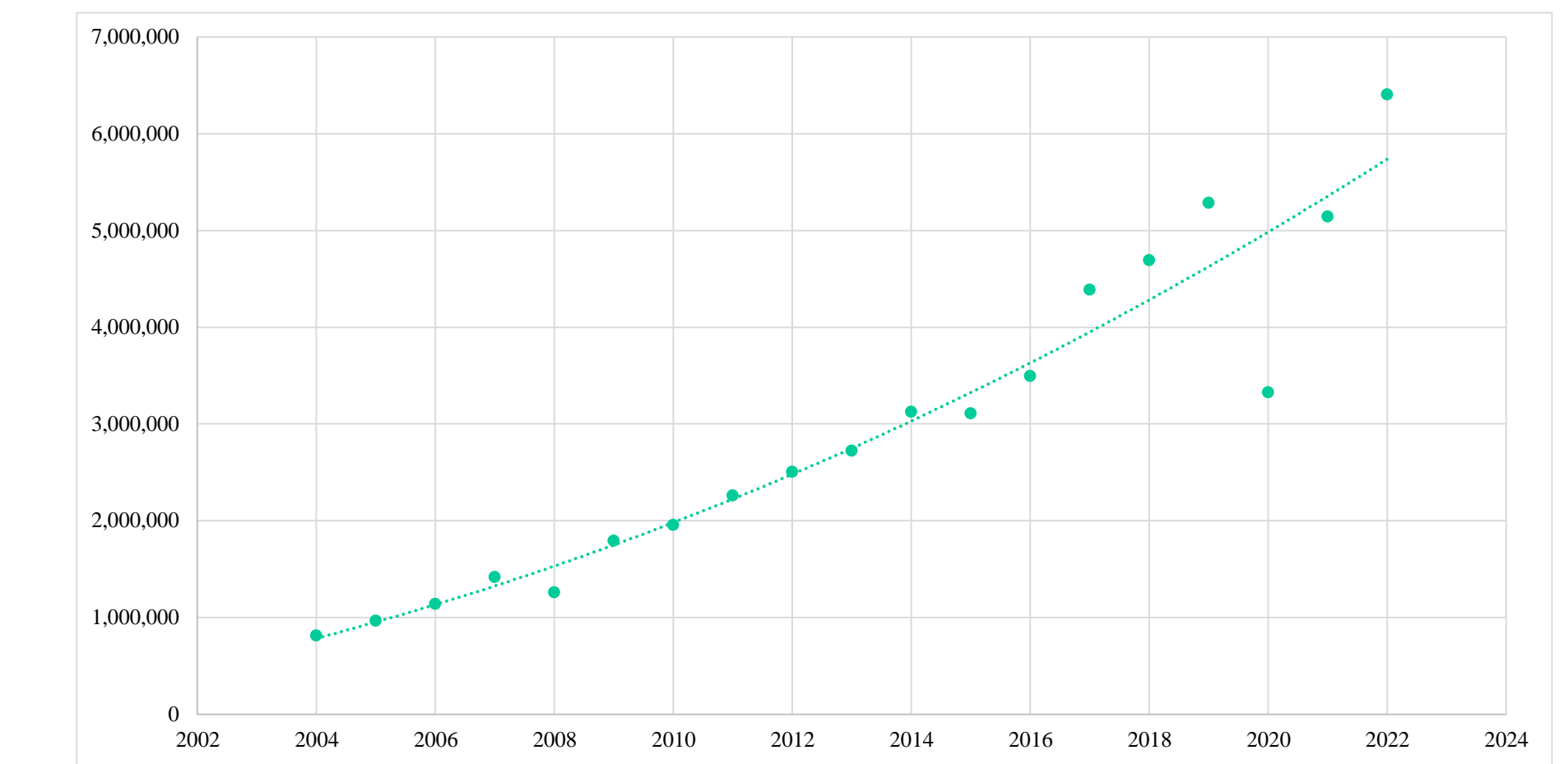


Figure 3 - Dotted Graph of Resident Placements 2004-2022.

The most accurately approximates the data by a polynomial of the second degree, which can be expressed by equation (1):

$$\hat{y} = 25060722118 - 25171300,19 \cdot x + 6320,53 \cdot x^2, \quad (1)$$

where x is the number of the year.

The average approximation error is 7.94%, which is a permissible level.

When forecasting the number of visitors to accommodation sites for domestic tourism (residents) for 2023 and 2024, data were received from 6,131,437 and 6,539,319 respectively, which corresponds to an increasing trend.

In order to identify the environmental factors affecting the number of domestic tourists, Table 9 was compiled, which shows data in the sections of the regions by influencing factors for 2021.

Table 9. Data by regions of Kazakhstan for 2021.

Region	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	y
Akmola	447	19,85	150	2	2	519	1893	1023	0,437	768472
Aktobe	162	23,3	120	1	6	1211	833	639	1,883	323155
Almaty	496	23	84	4	2	1227	8386	2349	16,894	1367189
Atyrau	98	27	63	2	4	156	227	374	0,255	100500
East Kazakhstan	375	19,5	140	5	4	1542	4524	1556	6,479	1101199
Zhambyl	291	23	83	1	2	12	4192	861	4,668	311922
West Kazakhstan	231	23,5	122	2	4	12	34	152	0,331	156729
Karaganda	271	19,5	120	2	1	550	2688	892	3,003	621561
Kostanay	269	21,8	140	2	2	746	1176	938	1,064	474043
Kyzylorda	120	27,5	70	3	2	161	326	250	1,4722	219858
Mangystau	97	26,5	31	1	0	223	2117	435	0,355	681775
Pavlodar	395	21,1	139	2	3	358	856	304	3,887	298617
North Kazakhstan	471	19,85	152	5	1	135	64	88	0,192	359699
Turkestan	405	25	53	0	2	431	4636	974	2,045	490909

Note. The table was compiled by the authors according to <https://new.stat.gov.kz/>

Here, x₁ is taken factor Average annual precipitation, mm, x₂ is taken factor Average temperature of July, C°, x₃ is taken factor Duration of period of stable snow cover, days, x₄ is taken factor Number of lakes (large, more than 100 km²) Number of rivers (large, over 500 km), Unit. For x₆ is taken factor Area of specially protected land, thousand hectares, x₇ is taken factor Number of protected plant species, units. Number of protected species of animals, units. The factor for x₉ is the availability of drinking and industrial groundwater resources, million m³/day, and the number of visitors. According to Table 9, a matrix of the paired correlation coefficients has been calculated, presented in table 10.

Table 10. Matrix of paired correlation coefficients

	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	y
x ₁	1									
x ₂	-0,69	1								
x ₃	0,50	-0,86	1							
x ₄	0,41	-0,42	0,46	1						
x ₅	-0,19	0,03	0,25	-0,03	1					
x ₆	0,29	-0,38	0,29	0,34	0,39	1				
x ₇	0,50	-0,13	-0,25	0,11	-0,19	0,52	1			
x ₈	0,50	-0,28	0,00	0,24	-0,02	0,74	0,91	1		
x ₉	0,48	-0,16	-0,06	0,37	0,00	0,57	0,86	0,85	1	
y	0,53	-0,37	0,06	0,42	-0,23	0,71	0,81	0,89	0,75	1

Table 11. Data on readiness to receive tourists by regions for 2021

Regions	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	y
Akmola	298	7951	2179	43816	450	7847	768472
Aktobe	103	5636	1073	99658	480	5124	323155
Almaty	531	7500	3288	180148	2363	8828	1367189
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North Kazakhstan	119	5745	498	51697	195	7113	359699
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Note. The table is compiled by the authors according to <https://new.stat.gov.kz/>

For the study of the impact of infrastructure and the readiness to accept tourists in the regions data for 2021 in the Republic of Kazakhstan were collected, which are indicated in table 11.

Here for x₁ is taken factor Number of accommodation, units, x₂ is taken factor Average cost of bed, tenge, x₃ is taken factor Number of employees, people, x₄ is taken factor Average monthly salary of travel agency workers, tenge, for x₅ is taken factor Number of visitors for religious and pilgrimage purposes, for x₆ is taken factor Length of roads with hard surface of republican value, km, y - number of visiting residents.

A matrix of pairwise correlation coefficients was constructed to detect the correlation of factors (table 12).

Table 12. Matrix of paired correlation coefficients according to table 11

	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	y
x ₁	1						
x ₂	-0,19	1					
x ₃	0,85	0,24	1				
x ₄	0,22	0,29	0,24	1			
x ₅	-0,04	-0,14	-0,26	0,14	1		
x ₆	0,76	-0,44	0,56	-0,23	0,01	1	
y	0,91	-0,03	0,86	0,15	-0,01	0,08	1

Based on the data of Table 12, it is possible to say that there is a strong direct link between factors x₁, x₃ (for x₁ is taken the factor Number of places, units, x₃ is taken the factor Number of employees, people) and y. Thus x₁ and x₃ are correlated, only one of these factors can be considered for further study.

To avoid multicollinearity, it is necessary to remove factors x₃ and x₆ from consideration. Further study showed statistical ignorance of factors x₂, x₄, x₅.

According to the results of the analysis of statistical data, the region's leading in terms of the number of locations are: Almaty, East Kazakhstan, Akmola, Karaganda, etc. This is due to the higher standard of living and the level of urbanization. The number of visitors for religious and pilgrimage purposes shows high values in the Turkestan, Kyzylorda and Karaganda regions. Akmola and Kostanay regions have the following average monthly wage in the amount of the minimum number of indicators; the highest indicator is found in Almaty and Atyrau regions. The indicator "Number of employees" has high values in Almaty region, the smallest - in Kyzylorda region. "Length of paved roads (km)" shows high values in East Kazakhstan and Karaganda regions, low values - in Atyrau region.

Conclusion

Thus, an integrated assessment and identification of evaluation criteria can solve the difficulties of harmonizing methodological approaches. Today, there are many-dimensional methods of estimating tourist potential, which is the most important issue of management of tourism activities at the administrative level of solving the problems of the tourism industry. The most qualitative assessment allows you to competently build a policy of development of sacral tourism and increase the competitiveness of tourism activities in the country.

The results of the study showed that the strongest impact on the increase in the number of tourists residents is the proposed infrastructure and the readiness of regions to receive tourists qualitatively.

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