DOI: 10.2478/mgrsd-2006-0030

MISCELLANEA GEOGRAPHICA
Vol. 12 2006 pp. 261-268

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METHODS OF ASSESSMENT OF THE NATURAL ENVIRONMENT IN EXAMINING THE RELATIONSHIP BETWEEN ITS DIVERSITY, VALUES AND TOURISM IN WESTERN AUSTRALIA'S NATIONAL PARKS

Abstract: In 2004, the author studied the impact of the diversity of the environment and natural values in national parks of Western Australia on the number of tourists visiting them. The research indicates that the highest correlation is between natural values and number of tourists, a smaller one is between the diversity of the environment and natural values and the lowest correlation is between the diversity of the environment and the number of tourists. Such studies require proper methods for evaluation of the natural environment. This paper discusses differences between the two main methods. The first, which describes diversity of the environment in national parks, is based on the evaluation made for the whole continent, where six main features of the environment were measured in the grid of squares. The natural values were studied with a greater accuracy on the basis of the descriptions and maps concerning the parks' territory. Attractiveness in respect to natural values is presented by the sum of points. Each park received from 0 to 2 points for each of the 18 natural values.

Key words: diversity of the natural environment, natural values, tourism, national parks, Western Australia.

INTRODUCTION

The relationship between man and nature is the research subject of regional geography. Such relations may deal with divers elements of the environment and different aspects of human activity. In 2004, in the Department of Regional Geography of the Faculty of Geography and Regional Studies of Warsaw University, a master's thesis was written under the supervision of prof. dr hab. Ewelina Kantowicz on the relationship between the diversity of the natural environment, natural values and tourism in Western Australia's national parks. (Bednarek 2004). The following hypotheses were presented in the thesis:

- the more diversified the natural environment in a given national park, the more tourists come to visit it,
- the more attractive the national park in regard to its natural values, the more tourists come to visit it,
- the more diversified the natural environment in a given national park, the more attractive the park in regard to natural values.

Among Western Australia's largest national parks, twenty five, for which a complete set of data was obtained, were analyzed. This paper deals exclusively with an analysis of differences in methods of assessing the natural environment in parks in relationship to the interpretation of results.

ASSESSMENT OF NATIONAL PARKS ACCORDING TO ENVIRONMENTAL DIVERSITY

It is believed that the more diversified the environment, the more attractive it is for man. It creates more opportunities for his development. This point of view is presented in various elaborations written in the Department of Regional Geography of Warsaw University in which relationships between environmental diversity and settlements in different regions of the world have been examined. For Australia, such research was carried out by Jaworska (1982), who covering the continent with grid squares with a 90 km side, executed diversity maps on geological construction, soil, plant cover, hydrographic network, climate and surface features. In each basic grid field she determined the number of lithological-stratigraphic rock types, number of soil types, number of plant types, river density, differences in annual rainfall, relative altitudes and valley density. She divided the values for all of Australia into five classes. Next, in each grid field she determined the diversity class product for the six basic components and finally divided the results into five classes. Thus, on the basis of element diversity maps, an environmental diversity map, presented comprehensively, was developed.

The maps discussed above were used by the Author of this paper (Bednarek 2004) to determine the degree of diversity of the natural environment and its elements in Western Australia's national parks. When a national park is located within one basic grid field or comprises fragments of neighboring fields, not differing in the diversity class, there is no problem in ascribing diversity values to it. However, some of the parks contain, within their borders, fragments of fields with different diversity classes. In each of the parks, environmental diversity was determined by multiplying the percentage of an area of a given class by its number and then totaling the products. It is worth noting that this method does not take under consideration the border between different basic fields with a different degree of diversification. Of course, it may not be precisely designated in the territory but the fact that within the national park borders areas of different diversity classes are

on the edge of one another suggests that there is a certain zone setting them apart. Therefore, it was decided to examine how the attribution to a park of such a class value as characterises the most diversified area within the park borders, will influence the results. It turned out that changes in the results are very small. Regardless of the method, over 80% of the parks are characterised by the second or third class of environmental diversity. The method of ascribing the highest values has such essential shortcomings as not taking under consideration the surface of an area with a given diversity and the scope of diversity between diversity classes of neighboring fields.

As mentioned above, the results of both methods are little diversified. It is interesting that only one park (François Peron N. P.), is characterised by the first class (least diversity). The fifth class, however, does not occur at all. Some parks are distinguished by various components but none are characterised by the fifth class of environmental diversity presented comprehensively.

More diversified results describing the environment, presented comprehensively, are to be reached applying the product of classes of six components. Using this method, only some values are repeated. It never occurs that more than four parks have the same value. As many as eleven have a unique value. With such an approach, for example, the Fitzgerald River N. P. is in first place in the area of environmental diversity. In second place, ex aequo, are the Stirling Range N. P. and Peak Charles N. P. All three, using the value reading method from the environmental diversity map presented comprehensively, are characterised by the fourth diversity class. Due to a greater diversity of a set, in examining the correlation between environmental diversity and tourism as well as between environmental diversity and values, it is possible to use the Spearman rank correlation coefficient and the rank difference analysis.

It must, however, be remembered that regardless of the method mentioned above, we always deal with values which are the result of research conducted on the entire continent. Therefore, the degree of environmental diversity ascribed to a park may not refer to the real park area. Even more, the side of a basic field is as much as 90 km while, for example, the width of the Leeuwin-Naturaliste N. P., stretched along the coast, usually does not exceed 10 km.

ASSESSMENT OF PARKS ACCORDING TO NATURAL VALUES

Examination of the parks' attractiveness in regard to their natural values, understood as elements of the natural environment, being of interest to tourists, was conducted on a much more precise scale. Materials on specific parks were used. Eighteen values were taken into consideration, keeping in mind both the principle of considering all environmental characteristics and the desire not to over represent any given element of nature. Of influence was also the character of data, often imprecise or incomplete. The examined

values include: seaside location, type of coast, land altitude above-sea-level, mountain-tops, canyons and gorges, caves, characteristic rock forms, dunes, river network, waterfalls, natural water reservoirs, plant formations, plant species, rare plant species, animal species, rare animal species, curiosities of flora and fauna, climate conditions. Characteristic rock forms do not include canyons, gorges, caves which were reviewed separately. The key issue was the selection of such values which may be presented by measurable and comparable for all the parks, environmental characteristics. For example, a seaside location is expressed by the length of the sea coast, climate conditions by temperature of air and a river network by the number of rivers and streams. In order to assess the attractiveness of parks in regard to natural values, the point bonitation method was used. Each park was given from 0 to 2 points for each value, where the higher value means greater attractiveness. In assessing a given park was compared with others. The issue is not to review an absolute number of points but to put in order according to attractiveness.

Lack of relationships between the existence of values in parks turned out to be of interest. For example, land altitude above-sea-level does not translate on the number of mountain tops. Areas with an extensive river network do not have to be characterised by numerous water reservoirs and the opposite. A great number of plant formations do not signify a greater number of species. Also, there are no visible links among the following three values such as canyons and gorges (expressed as one value), caves and characteristic rock forms.

Fitzgerald River N. P. turned out to be the most attractive park, jointly receiving 22 points. It gained the maximum number of points (2) for the length of the shoreline, coast type, more significant mountain tops, river network, number of plant species, number of rare plant species, number of rare animal species and air temperature. The D'Entrecasteaux N. P. (20 p.) was in second place, and the Leeuwin-Naturaliste N. P. was third (18 p.). The Goongarrie N. P., which jointly received only 3 points (for natural water reservoirs and land altitude above-sea-level) turned out to be the least attractive park. It is also interesting that no relations between the sum appraisal and individual values were observed. This should be understood as there are no value groups which could decide about the high total assessment of the park.

DIVERSITY OF THE ENVIRONMENT AND NATURAL VALUES VERSUS TOURISM

Tourism was expressed by the mean annual number of tourists in a three year period (July 2000 –June 2003) on the basis of data from the *Visitor Information Statistics...* (2003).

Several methods were used to examine the correlation between the diversity of the natural environment, natural values and tourism in twenty

five national parks. They are the Spearman rank correlation coefficient and the rank difference analysis, class diversity method and the T coefficient method. The variable T is the ratio of the mean number of tourists annually visiting a national park with a given class of a chosen element to the mean annual number of tourists per one park. A number greater than 1 bears testimony to a park's particular attraction force. The Spearman rank correlation coefficient recognizes values from –1 to 1. The value of the coefficient shows the dependence and the sign shows the direction. The results are presented in tables 1-4. The following signs were used:

E – diversity of the natural environment
V – natural values
T – tourism

Table 1.

Spearman rank correlation coefficient – comparison of results

E vs. T	V vs. T	E vs. V
0,282	0,616	0,503

Source: Bednarek 2004

Table 2.

Rank difference analysis – comparison of results

|RANK DIFFERENCE|	NUMBER OF PARKS		
	E vs. T	V vs. T	E vs. V
0 – 4,5	8	14	13
5 – 9,5	10	7	8
10 – 14,5	4	4	3
15 – 19,5	3	0	1
20 – 24	0	0	0

Source: Bednarek 2004

Table 3.

Class method difference – comparison of results

CLASS DIFFERENCE	NUMBER OF PARKS		
	E vs. T	V vs. T	E vs. V
0	10	13	14
–1 or 1	12	12	10
–2 or 2	3	0	1
–3 or 3	0	0	0

Source: Bednarek 2004

Table 4.

Coefficient T – comparison of results

CLASS	COEFFICIENT T FOR PARK CLASSIFIED AS	
	E	V
1	0,29	0,02
2	0,43	0,24
3	1,89	0,68
4	0,36	5,18

Source: Bednarek 2004

It is clearly visible that the strongest correlation occurs between natural values and tourism. Somewhat weaker is the relationship between environmental diversity and values. Results which were reached by numerous methods do not differ significantly. The rank difference analysis shows a somewhat stronger relation between values and tourism than might have been expected by only interpreting the rank correlation coefficient. The Coefficient T clearly indicates that the greater the attractiveness of the park in regard to values, the greater number of visitors in the park.

INTERPRETATION OF RESULTS AND THE RESEARCH METHODS APPLIED

While interpreting the reached results, constrains stemming from particular examining methods of correlations may not be overlooked. The Spearman rank correlation coefficient is the one figure expressing dependence and even single, but very significant rank difference strongly influences its value. Therefore, it is important to analyse how many parks belong to a given rank difference segment. Methods for designating segments may differ. The class difference method is based on the division into segments, identified from the environmental diversity map, presented comprehensively. Division according to the principle of similar number of parks in corresponding classes, is artificial. The coefficient T is the method for meeting real tourism values. However, a very large number of tourists in only one park may decide on the high value of a coefficient. The coefficient T clearly indicates the enormous "power of attraction" of the highest class of values. However, after rejecting the park with an extremely high number of tourists, the coefficient T assigns the highest value for the third class. This value is over three times smaller than the maximum coefficient value, obtained in examining twenty five parks. It must also be remembered that division into classes influences the value of the coefficient T.

The essence of this paper, however, is an analysis of the impact of the natural environment assessment method on the correlation results. How can it project onto the results?

Foremost, the difference in the precision of research must be kept in mind. As it has already been said, environmental diversity assigned to parks is based on research conducted within the scale of the continent in defined basic fields. Assessment of parks in regard to natural values is much more detailed and comprises those elements which may attract tourists to the area. Even if environmental diversity be designated in much smaller basic fields assessment would not be identical with determining the attractiveness level in reference to values.

These two methods take under consideration somewhat different environmental characteristics. Assessment of environmental diversity may be used for research on relations concerning various aspects of human activity.

However, value assessment was carried out from a perspective of needs or more precisely, from the perspective of tourist interests. Such natural objects as waterfalls, caves, sandy beaches and very large trees do not comprise the method of defining the natural environment but are taken into consideration in park assessment in reference to values. Next, the comprehensive approach to environmental diversity considers, among others, soil diversity, which do not seem to have any special significance for an average tourist, however may be linked to interesting plant population.

Of course, environmental diversity may also attract tourists and it may not be ruled out that the correlation between diversity analyzed in a more precise scale and tourism would be greater. It seems that for tourists, the greatest meaning have those environmental characteristics which are linked with landscape diversity.

A separate issue is the value assessment method. The point bonitation method is not the only method for park assessment in regard to values. Besides, in applying this method a scale greater than the three degree scale may be used. In the case of research for Western Australia's parks, the scale range was dictated by the character of data. At the same time, it is worth noting that very precise calculations may sometimes render difficult the perception of some general interrelations.

In the conducted research value calculations were not made in accordance with the park areas. It seems that this procedure would lead to determining a certain "park saturation with values", which itself may be appraised as an additional, separate value. One may assume that tourism treats a park as a whole and does not analyse, for example, how many protected species, on the average, are to be found within a km^2. It is worth adding that no relationship was noted between the size of parks and attractiveness in regard to values. For example, Western Australia's largest national park – Rudall River N. P. (with an area of about 1.3 mln ha) is on the seventeenth position in regard to values.

Finally, it is worth noting an interesting case. The Leeuwin-Naturaliste N. P. and the D'Entrecasteaux N. P. are located relatively close to one another. Both stretch along the sea cost of the south-western end of the state (the coast line of each is over 100 km long) and are within vicinity of the same cities. In regard to the environmental diversity they both are in the third class and both have a very large sum total in reference to values. The D'Entrecasteaux N. P. is in second place with 20 points and the Leeuwin--Naturaliste N. P. is third with two points less. However, in reference to tourism, there is a great difference between them. The Leeuwin-Naturaliste N. P. is the most often visited park. Annually, it is visited by over 1.5 mln tourists whereas the D'Entrecasteaux N. P. is in a distant 12th place, with 25 thousand annually. What is the source of such a large disparity? Do they negatively reflect upon the conducted value assessment? It must be noted that the Leeuwin-Naturaliste N. P. is a park with an extremely high number of tourists in relation to subsequent parks which, in regard to the number

of tourists, are visited by fewer than 200 thousand persons. Of course, one may question the tourists' preferences and probably persons interested by caves will chose the Leeuwin-Naturaliste N. P., where there are over 360, including many known for their beauty and largeness (*Leeuwin-Naturaliste...* 1989). Answering the posed question, above all one must indicate other factors which may attract tourists. They certainly include tourism development (infrastructure). This element has not been discussed in the research but may be of significance. It needs be stressed that the Leeuwin-Naturaliste N. P. has numerous facilities and recreation sites and its structure rather resembles several neighbouring parks with an excellently developer infrastructure.

CONCLUSIONS

Research carried out on Australia's greatest national parks has shown that there is a rather strong correlation between natural values and tourism. However, no significant relationship was observed between diversity of the environment and tourism. Interpretation of results may not take place separately from the methods used. In the case of examining the relationship between the natural environment and tourism, proper assessment of the environment gains special significance. Especially important is the type of source documents, the elaboration details, selection of representative features of the environment and the calculation method.

REFERENCES

Bednarek M., 2004, *Zróżnicowanie środowiska i walory przyrodnicze a ruch turystyczny w parkach narodowych Australii Zachodniej* [Diversity of the environment and natural values versus tourism in Western Australia's national parks; in Polish, a master thesis manuscript], Faculty of Geography and Regional Studies, Warsaw University, Warszawa.

Jaworska K., 1982, *Zróżnicowanie środowiska przyrodniczego a gęstość zaludnienia w Australii* [Diversity of the natural environment and population density in Australia; in Polish, a master thesis manuscript] Faculty of Geography and Regional Studies, Warsaw University, Warszawa.

Leeuwin-Naturaliste National Park Management Plan 1989-1999, 1989, m. p. no. 13, Department of Conservation and Land Management (CALM), Como.

Visitor Information Statistics (VISTAT) Tables. Internal publication, 2003, Department of Conservation and Land Management (CALM).

English translation: Małgorzata Miłaszewska