

## **ANTHROPOGENIC IMPACT ON REPRESENTATIVE TERRITORIES IN VITOSHA NATURE PARK**

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**Abstract.** Vitosha Nature Park was established in 1934. It is situated nearby the Bulgarian capital Sofia and the anthropogenic impact on the natural ecosystems is a result mainly of recreation and other complementary activities. Results of a field study on 6 representative sample plots were presented. Changes in upper soil horizons, litter structure and vegetation due to recreational activity were assessed. The sample plots were classified into three main classes according to calculated coefficients of change.

**Keywords:** nature park, anthropogenic impact, recreational activity.

### **AIMS AND BACKGROUND**

Vitosha Nature Park is the oldest protected area in Bulgaria and on the Balkan Peninsula<sup>1-4</sup>. It was established in 1934. Its contemporary status and location – nearby the capital of Bulgaria – Sofia determine its significance for recreational activity. The park has been visited by more than 1 million people per year. The complementary functions of the park contradict very often to the main one – conservation. As a result of the intensive and almost uncontrolled tourist flow and the irregular distribution of the visitors, changes in the ecosystems and their components can be observed.

The study was carried out on two representative for recreational activity territories in Vitosha Nature Park – Tourist and Sports Center “Aleko” and “Zlatni mostove” Natural Site, where high concentration of visitors was registered. Six sample plots were established along the most popular tourist paths.

### **EXPERIMENTAL**

The assessment of the anthropogenic impact was made using the methodology of Emsis<sup>5</sup>. The main groups of indicators were as follows:

**Basic** – bare upper soil horizon and missing litter. They were determined visually in balls from 0-10 (0 – symptoms missing; 10 – symptoms clearly defined on the whole area).

**Complementary** – damaged young growth, mechanical damages on trees, fire-places, wastes, etc. They were determined in balls from 0-3 (0 – symptom missing;

1 – symptom insignificantly expressed; 2 – symptom significantly expressed; 3 – symptom significantly expressed on the whole area).

The calculation was made according to the following formula:

$$I = \sqrt{\sum K_i P_i + \sum P_{mi} / n},$$

where  $K_i$  is the coefficient of importance;  $P_i$  – basic indicators;  $P_{mi}$  – complementary indicators  $n$  – number of indicators.

According to the calculated values, levels and classes of changes were determined<sup>5</sup> and presented in Table 1.

**Table 1.** Determination of levels and classes of changes

| Coefficient of changes | Degree of changes | Class of changes |
|------------------------|-------------------|------------------|
| 0-0.5                  | –                 |                  |
| 0.6-0.9                | +                 | low              |
| 1.0-1.2                | I                 |                  |
| 1.3-1.4                | II                | medium           |
| 1.5-1.6                | III               |                  |
| 1.7-1.8                | IV                | high             |
| Over 1.9               | V                 |                  |

## RESULTS

The results obtained during the performed study were presented in Tables 2-5.

**Table 2.** Values for the main and complementary indicators in sample plots No 1, 2, 3 in the area of Aleko Sport Center

| Sample plot | Indicators              |                |               |                    |                      |               |             |
|-------------|-------------------------|----------------|---------------|--------------------|----------------------|---------------|-------------|
|             | main                    |                | complementary |                    |                      |               |             |
|             | bare upper soil horizon | missing litter | wastes        | mechanical damages | damaged young growth | picnic places | fire places |
| 1           | 0                       | 2              | 3             | 0                  | 1                    | 1             | 1           |
| 2           | 2                       | 0              | 1             | 0                  | 0                    | 1             | 1           |
| 3           | 2                       | 1              | 1             | 1                  | 1                    | 0             | 0           |

**Table 3.** Assessment of the changes in the area of Aleko Sport Center

| Sample plot | Coefficient of changes | Degree of changes | Class of changes |
|-------------|------------------------|-------------------|------------------|
| 1           | 1.7                    | IV                | high             |
| 2           | 1.0                    | I                 | low              |
| 3           | 1.4                    | II                | medium           |

**Table 4.** Values for the main and complementary indicators in sample plots No 4, 5, 6 in the area of “Zlatni mostove”

| Sample plot | Indicators              |                |               |                    |                      |               |             |
|-------------|-------------------------|----------------|---------------|--------------------|----------------------|---------------|-------------|
|             | main                    |                | complementary |                    |                      |               |             |
|             | bare upper soil horizon | missing litter | wastes        | mechanical damages | damaged young growth | picnic places | fire places |
| 4           | 1                       | 2              | 1             | 0                  | 0                    | 1             | 1           |
| 5           | 1                       | 1              | 1             | 0                  | 1                    | 1             | 1           |
| 6           | 2                       | 1              | 1             | 0                  | 0                    | 1             | 1           |

**Table 5.** Assessment of the changes in the area of Aleko Sports Center

| Sample plot | Coefficient of changes | Degree of changes | Class of changes |
|-------------|------------------------|-------------------|------------------|
| 4           | 1.6                    | III               | medium           |
| 5           | 1.3                    | II                | medium           |
| 6           | 1.4                    | II                | medium           |

The obtained results in the two areas of investigation showed a relatively high degree of changes of the nature components. The medium change class was dominating.

The mostly expressed symptoms of anthropogenic impact that form the final assessment were the main indicators and some of the complementary ones – wastes, picnic and fire places, mechanical damages on the trees, etc.

## CONCLUSIONS

The anthropogenic influences had caused significant changes in Vitosha Nature Park, in spite of its protective status and the restrictions of the applied regimes. The results of the study showed that the areas of two of the mostly visited recreational centers – “Aleko” and “Zlatni mostove” were considerably affected by tourist activity. According to the applied methodology the changes observed included bare upper soil horizon, missing litter, damaged young growth, mechanical damages on trees, existence of fireplaces, wastes, etc.

In order to avoid future degradation of nature the following recommendations could be formulated:

- The existing data base for tourist flow should be actualized and special attention should be paid to those areas, mostly influenced by visitors.
- A system of tourist routes should be developed aiming at regular distribution of the visitors on the park territory.
- The information system should be improved and a strict control should be exercised.

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