



## USE OF KRYVYI RIH MINING AND INDUSTRIAL LANDSCAPES FOR VARIOUS TYPES OF SPORTS TOURISM

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**Abstract.** *Sports tourism is one of the areas of active recreational activities in the structure of mass leisure development. Ensuring sports tourism requires finding and substantiating new areas for hiking routes, expanding the training base with new suitable facilities, and finding new areas for competitions in various types of sports tourism. Anthropogenic mining landscapes are one of the potentially promising areas in Ukraine. In the work for the purposes of sports tourism, they are considered the example of the territory of Kryvyi Rih. In the article description of mining landscapes of Krivbass region is expounded for the aims of sporting tourism. All of basic types of obstacles are rotined, the estimation of level of their complication is given, developed recommendation on the use of mining landscapes in sporting tourism.*

**Key words:** *mining landscapes, sports tourism, technogenic tourism, hiking tourism, mountain tourism, speleological tourism, cycling tourism.*

### **Introduction.**

The aim of the work is to assess the potential of anthropogenic mining landscapes of Kryvyi Rih for the purposes of sports tourism. The main tasks were to characterize the prerequisites for the development of sports tourism on the basis of anthropogenic mining landscapes, assess the nature and complexity of individual anthropogenic mining landscapes and their components for various types and forms of sports tourism, and develop proposals for sports tourism in the region.

### **Main text.**

The Kryvyi Rih region is characterized by a long process of development of iron ores and granites (128 years), which led to the formation of all known taxa of anthropogenic landscapes. A separate class of anthropogenic landscapes is industrial, which is divided into factory and mining subclasses.

Denisyk G.I. notes that Kryvbass is the most unique region, in terms of recruitment and territorial structure of anthropogenic mining landscapes [1]. In the relatively small territory of Kryvyi Rih (4.1 thousand km<sup>2</sup>) the most diverse groups of mining anthropogenic landscapes were formed. The region is a modern unique landscape - almost all known varieties of man-made landscapes of Ukraine are spatially connected here. The most valuable objects for sports tourism are anthropogenic mining landscapes - dumps, quarries, mine dips, open mine cavities,



and sludge dumps of the Mining and Processing Plant [2, 3]. All these landscapes are characterized by stony or loamy-sandy substrate, significant steepness of slopes (20-45° and more), high-grass thickets, dense and sparse forest, piles of boulders, gravel roads, quarries in the presence of rocks, small hilly surface steep wells of mine dips up to 50 m deep, vertical and cascading underground passages of mines to a depth of 100 m and more, the presence of horizontal galleries, etc.

To assess the potential of anthropogenic mining landscapes for the purposes of sports tourism, standard types of sports tourism in Ukraine are taken as a basis, which is classified and categorized by the Federation of Sports Tourism of Ukraine (FSTU). The used methods are tested and recognized in Ukraine, and their application for the assessment of anthropogenic mining landscapes for sports tourism was carried out in Ukraine for the first time.

1. Potential of anthropogenic mining landscapes for hiking. When assessing the complexity of transitions in hiking, 2 groups of obstacles are taken into account - local (river crossings, passes, peaks, ridge traverse, canyon) and long (vegetation, swamps, screens, and moraines, sands, snow, water rafting). The surface of the anthropogenic mining landscapes of Kryvyi Rih has only 2 obstacles out of all these obstacles (Table 1). These obstacles are long - overcoming areas with diverse vegetation and rocky surfaces.

**Table 1.**

**Assessment of barriers within anthropogenic mining landscapes**

Characteristics of the obstacle and its complexity	Presence among mining anthropogenic landscapes of Kryvyi Rih
<b>Prolonged obstacle - vegetation</b>	
<b>N/C (easily passable forest).</b> The forest runs along paths or easily without them	Rare forests (savannah type) on the surface of 40-80-year-old rocky dumps. <b>Significant spread</b>
<b>1A (medium passable forest).</b> The presence of densely overgrown areas, undergrowth	There is, but such areas are <b>very limited</b> , so to gain a continuous distance of several kilometers is problematic
<b>1B (tall grass).</b> Hidden in the grass slope irregularities, depressions, stones, slope steepness not less than 20 °	<b>The main obstacle.</b> Block and gravelly surfaces of iron ore dumps. Continuous transitions reach 0.5-6.0 km
<b>A long-standing obstacle is scree</b>	
<b>N/C (small, sloping).</b> The stones are small, the slope is 15-20 °	<b>Almost absent</b> due to the design significant steepness of the dumps in 30-35°
<b>1A (medium, inclined).</b> "Living" stones up to 1 m in size, slope steepness up to 25 °, individual insurance	<b>Limited distribution</b> for the previous reason - the initial steepness of the slopes of the dumps corresponds to steep surfaces
<b>1B (small, steep).</b> The talus is "alive", the steepness of 30-40 °	<b>The main obstacle</b> due to the predominantly gravelly substrate of the surfaces of slopes and plateaus of stony heaps
<b>2A (medium, steep).</b> "Living" stones up to 1 m in size, slope steepness 30-35 °, individual insurance	<b>The main obstacle</b> , common, at considerable distances (up to 1-2 km), is inherent in young dumps

*Author's development*



Thus, the anthropogenic mining landscapes of Kryvbas are characterized by initial and medium complexity. Under conditions of a certain complexity within the mountain anthropogenic landscapes of the region, all types of sports and tourism activities can be carried out: 1) training of beginners before categorical hikes in another area; 2) competitions in hiking equipment on dumps; 3) planning and conducting experimental sports trips - non-category and category I complexity.

2. Potential of anthropogenic mining landscapes for the purposes of mountain tourism. The main obstacle for mountain tourism is overcoming the pass within the mountain range. It is clear that this cannot be on the plain, but anthropogenic mining landscapes can be considered for the purposes of mountain tourism. The main forms are the use of anthropogenic mining landscapes for training and competitions in mountain tourism. The slopes of the dumps, the rocks of the sides of the quarries, and the rocks of the cliffs of failed wells can be used. These mining anthropogenic landscapes should be taken as analogs of mountain slopes and pre-pass takeoffs.

Within the slopes of rocky dumps, it is possible to model approaches and overcome mountain passes of low categories N/C, 1A, and 1B. Individual and group movement techniques are practiced here in connection with anchor insurance, work with an ice ax, self-restraint on scree and grassy steep slopes, and overcoming light rocks on the walls of quarries. Complex and steep (25-50° and more) rocky slopes of quarries and dip wells are suitable for training railing insurance on hooks, descents, and ascents with insurance. Such conditions simulate the complexity of scree areas of passes 2A-2B of complexity categories.

3. Potential of GPAL for the purposes of speleological tourism. Speleotourism involves overcoming complex horizontal and vertical natural caves. Within the mining anthropogenic landscapes of Kryvyi Rih, analogs of natural caves were formed - gallery and to a greater extent vertical mines with horizons. Mine - a set of vertical wells (trunks, logs) and working horizontal galleries. The depth of old and abandoned mines reaches 100-300 m, working up to 1540 m in depth and exceeding any natural caves in Ukraine in depth. The potential wells for speleotourism are the rock wells of the mines above the trunks and the produced space. Experimental descents of some mine mining anthropogenic landscapes allowed us to assess their potential for speleotourism (Table 2).

**Table 2.**

**Estimation of obstacles within the cavities of mining anthropogenic landscapes**

Characteristics of the obstacle and its complexity	Presence of anthropogenic landscapes of Kryvbas among mining areas
<b>I the category of complexity.</b> Wells no more than 40 m deep and easy to pass, dry. Horizontal caves with water and narrowings. Total depth 20-100 m	Vertical simple failure wells with a depth of 40-60 m. The following 2 wells are known. 1 shallow shaft of a flooded mine
<b>2A category of complexity.</b> Wells can be with water, horizontal caves with an open siphon. Total depth 40-180 m	Vertical mine passages (underground passage, shafts) with horizontal sections and wells. There are 3 such open mines in Kryvbas

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Potentially in the Kryvbas region can be identified more complex man-made caves - 2B, 3A, and even 3B categories of complexity (up to 600 m). However, their presence requires experimental verification - passing and re-evaluation. However, the well-known is already enough to organize experimental speleotouristic trips of I-II categories of complexity. It is also possible to use Kryvyi Rih mines for the training process.

4. Potential of anthropogenic mining landscapes for cycling tourism. Cycling, like all other types of tourism, also involves overcoming the control distance (in km) and certain obstacles. Obstacles almost repeat those adopted in hiking, but also take into account such characteristics as the features and substrate of the road surface and cross-country terrain. For cycling tourism within the anthropogenic mining landscapes can be recommended - scree of dumps with slopes and vegetation. The assessment of these obstacles repeats the same estimates of complexity as for hiking (Table 1).

A special coefficient is used to estimate the road surface, which varies from 0.8 to 2.5. Areas difficult for cycling in Kryvyi Rih are common on the surfaces of rocky dumps and quarry roads. The degree of complexity of roads within mining anthropogenic landscapes is estimated by us as average (Table 3).

**Table 3.**

**Estimation of the coefficient of road surface within mining anthropogenic landscapes**

coverage ratio	Presence of anthropogenic landscapes of Kryvbas among mining areas. Characteristics of the road
1,0	Gravel driveways to the dump and to the quarry. Trails and virgin surfaces of dumps. <b>Distributed slightly</b>
1,3	Rocky and gravelly dump and quarry roads, virgin surfaces of dumps. <b>They are widespread</b>
1,6	Rocky and gravelly dump and quarry roads, virgin surfaces of dumps with large irregularities. <b>Significant distribution</b> over long and continuous distances (up to 2-3 km)

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An important indicator for assessing the sportiness of mining anthropogenic landscapes for cycling is the coefficient of the intersection of the terrain (from 0.8 to 1.4). This takes into account the difference in altitude in neighboring areas, which are overcome along the route. Kryvyi Rih mining anthropogenic landscapes were assessed by us as high (Table 4). The main landforms that complicate the cycling route are dumps, quarries, sinkholes, and hollows with terraces. The slope of the slopes of these mining anthropogenic landscapes is marked by the highest value of the steepness of the rise - 2.0, as the steepness of the slopes varies between 15-45°.

Characterizing the coefficient of altitude gain, we note that the relative height differences within Kryvbas, under conditions of frequent alternation of mining anthropogenic landscapes can be brought to altitude - if desired from 200 to 1000 m. The coefficient of altitude will increase from 1.0 to 1.4 ( at the maximum - 2,8). At the same time, due to the fact that the mining anthropogenic landscapes of Kryvbas are located on the Eastern European Plain, the absolute marks of the earth's surface



do not exceed 200 m and the depth in the quarries below sea level is not more than - 250 m.

**Table 4.**

**Estimation of the coefficient of the intersection of the relief within the mining anthropogenic landscapes**

Coefficient of intersection	Presence of anthropogenic landscapes of Kryvbas among mining areas
1.0 - rugged terrain, height differences of 30-50 m	Low (height up to 20 m) and medium (20-50 m) iron ore and granite dumps, failure funnels and hollows up to 50 m deep, shallow quarries, terraces of dips
1,2 - average terrain, height differences of 50-100 m	High (50-100 m) iron ore dumps, medium failure funnels (100 m), shallow quarries
1,4 - rugged terrain, height differences of 100-200 m	Ultra-high (100-130 m) iron ore dumps and sludge storages, deep failure funnels (up to 150 m), medium, deep and ultra-deep quarries (up to 365 m)

*Author's development*

The described level of complexity of the intersection of relief, road surface, and complexity of obstacles within mountainous anthropogenic landscapes of Kryvbas allows organizing the following types of cycling activities - competitions in cycling equipment, trial, cross, mountain bike competition (mountaineering, mountaineering) VI categories of difficulty, to carry out experimental training trips on the weekend.

5. Potential of GPAL for climbing purposes. Climbing - passing purely rocky routes. The main requirements for rock climbing trails are the presence of short or long trails (15-30 m), which are held on time, individually or in conjunction with or without insurance (bouldering). According to domestic assessment methods, the degree of complexity of free climbing is divided into 6 grades - from I (very easy) to VI (extremely difficult).

Kryvyi Rih quarries are an excellent base for two forms of climbing - training in mountaineering techniques and competitions. The rocks in the quarries are mostly flat surfaces of crystalline rocks with a slope of 45-90° - the so-called berms of terraces in working and closed quarries and simple sides of old iron ore quarries. There are many places to start climbing in Kryvbas, access to the quarry rocks is free, and most of the quarries are located within the city limits. The degree of complexity of individual quarry rocks varies from I to IV categories (very light, light, medium, heavy). Therefore, Kryvyi Rih quarries as a kind of mining anthropogenic landscapes have significant potential for serious sports climbing.

**Summary and conclusions.**

Kryvyi Rih mining anthropogenic landscapes are generally suitable for hiking (hiking, biking, and caving), training, and competitions in almost all types of sports tourism (except skiing and water). The complexity of the anthropogenic mining landscapes of Kryvbas is mainly initial and medium. Approbation of the provisions mentioned in the article requires the advertising of the sports and tourism potential of the region and the organization of pilot (experimental) activities.



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