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Assessment of geomorphic risks and attractiveness for recreational purposes

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ГЕОГРАФИЧЕСКИЙ ФАКУЛЬТЕТ
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1. INTRODUCTION

In a progressively developing scope of tourism the interconnection of relief, as the basis of landscape, and recreation has become a topical question. It allows more efficient use of natural resources, as well as ensures the safety of recreation. Approach to identify and evaluate recreation and geomorphologic potential is based on the notion of “fields of attractiveness and risk” Comprehensive study and assessment of each qualitative field gives a value of relief influence on a person. This quantity which indicates a complex functional suitability of an area for recreational purposes should be called “recreational and geomorphologic potential”.

The assessment of geomorphic risk and attractiveness is particularly important for the areas with high contemporary geodynamics (South Iceland, Sicily, Kamchatka peninsula). In such territories along with high recreational attractiveness we should take into account enormous risks induced by active relief dynamics.

2. THE ASSESSMENT METHOD

In recreational system relief could be considered from two different viewpoints. On the one hand it is one of the main elements of natural and information resources which are aimed at satisfying recreational requirements of people. On the other hand relief is an external element which makes the system functioning.

Interrelations between subjects/objects of recreational activity and the environment are considered from a position of system theory. This methodological point of view allows clearly retrace interconnections and mutual influence of different components on each other.

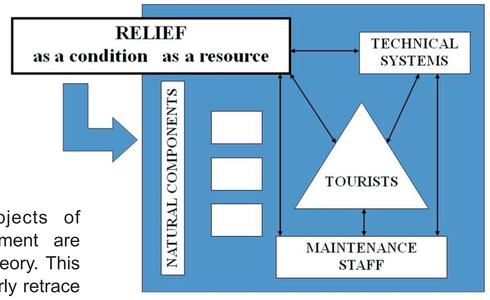


Figure 1. Position of relief with respect to recreational system (Modified from Bredikhin, 2010).

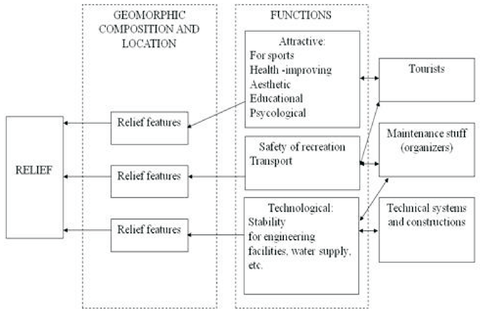
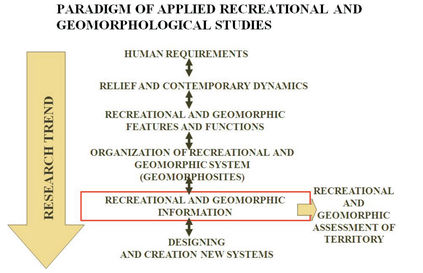


Figure 2. The structure of recreational and geomorphic system (Modified from Bredikhin, 2010).

Recreational and geomorphic system is a particular kind of systems. In it the entire recreational system and its components (subjects – tourists, maintenance stuff, objects – technical systems, constructions) enter into different relations with relief. These interrelations are based on relief features expressed in geomorphic composition and location through a functions set (such as aesthetic, educational etc.).

In this context a new branch called recreational geomorphology was emerged in geosciences. The subject of investigation is relief characterized by specific properties and relations within the recreational and geomorphologic system.



There are two general domains of relief and recreation mutual influence: recreational and geomorphic (RG) **risks** and RG **attractiveness.** Risk is a measure of the probability and severity of an adverse effect to life, health, property, or the environment. The interaction between geomorphological basis and recreational activity could be represented as a special field of risk. The tension of this field could be measured by value of risk which corresponds to consequences weight.Attractiveness of relief should be determined by a complex parameter, composed of particular relief properties (uniqueness, diversity, aesthetic appeal).

Field of attractiveness and field of risk together form some kind of coordinate system. The value of relief capacity for having positive influence on a person (physical, psychological etc.) can be placed in it.

Figure 3.Fields of relations between relief and elements of recreational system (Modified from Bredikhin, 2010).

Table 1.An example of attractiveness calculations

Relief features		Attractiveness
Morphometric	Altitude	1
	Vertical ruggedness	2
	Horizontal ruggedness	0
	Gradient of slope	2
	Slope exposure	0
Intensity of coastal events		1
Grain size distribution		3
Geomorphosites of various genesis	Karstic	0
	Atmogenic	3
	Biogenic	0
	Caused by erosion	3
	Reservoirs (various genesis)	2
	Post-volcanic occurrence	3
	Presence of several altitude levels	0
	Ribs	0
	Presence of islands and peninsulas	0
	Glacial	0
Presence of contemporary glaciation		0
Average		2,22

Table 3. RGP dependence on risk-attractiveness ratio

Risks		Low	Medium	High
	High	1	1	4
	Medium	2	3	3
	Low	2	3	3
		Attractiveness		

Types of RGP:
1. Insufficient
2. Medium
3. Optimum
4. Extreme

Estimation of attractiveness and risk value must be carried out by means of composite indexes which include particular rates of relief features (rareness, diversity, aesthetical attractiveness etc.).

The quantity which indicates a complex functional suitability of an area for recreational purposes should be called “recreational and geomorphic potential” (RGP).

Table 2.An example of risk calculations

Danger (threat) – a natural phenomenon that could lead to damage (various genesis)	Risks
Earthquakes	0
Volcanic eruptions	1
Landslides	3
Mud flows	3
Avalanche	1
Abrasion	0
Thermoabrasion	0
Coastal dinamycs	1
Piping	0
Erosion	1
Thermokarst	0
Soil heaving	0
Solifluction	2
Averange	1,71

3. CASE STUDIES

This approach was applied for three sample areas: Northern-West Sicily (Italy), Southern-East Iceland and Eastern coast of Kamchatka peninsula (Russia). The choice of sample areas was not random. All of them correspond to significant examples of modern recreational systems in areas with high contemporary geodynamics. Therefore it was particularly interesting to compare the structures of RGP for such different and specific areas.

3.1 Trapani area

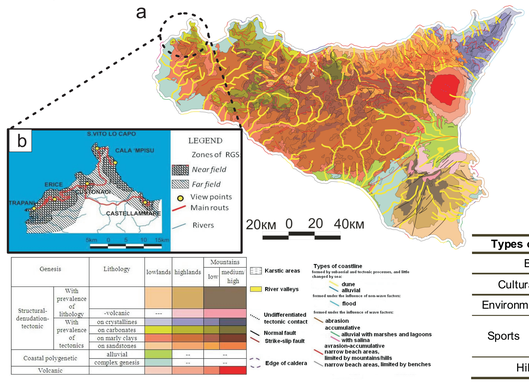


Figure 4 Recreational and geomorphic system of RGS Trapani: a) geomorphic scheme of Sicily, b) scheme of recreational structure of RGS.

Table 4 RGP for different types of recreation activities (Trapani area, NW Sicily, Italy)

Types of recreation		Attractiveness	Risk	Potential
Bathing		2,2	1,86	Optimum
Cultural education		1,67	1,86	Medium
Environmental education		2,75	1,86	Optimum
Sports	Trekking	1,8	1,86	Medium
	Fishing	2	1,86	
Hillwalking		2,33	1,86	Optimum

3.2 Skaftafell National Park

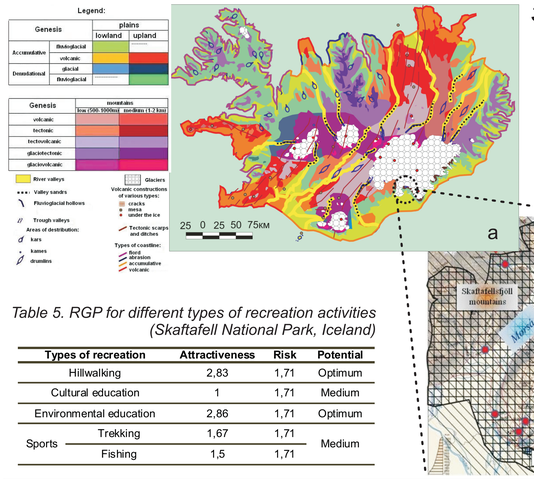


Figure 5 Recreational and geomorphic system of Skaftafell National Park: a) geomorphic scheme of Iceland b) scheme of recreational structure of National Park.

Table 5. RGP for different types of recreation activities (Skaftafell National Park, Iceland)

Types of recreation		Attractiveness	Risk	Potential
Hillwalking		2,83	1,71	Optimum
Cultural education		1	1,71	Medium
Environmental education		2,86	1,71	Optimum
Sports	Trekking	1,67	1,71	Medium
	Fishing	1,5	1,71	

3.3 Kamchatka peninsula

The most significant part of work was done for the third sample area. It is situated in the Far Eastern Russia on Kamchatka peninsula within Nalychevo Nature Park.

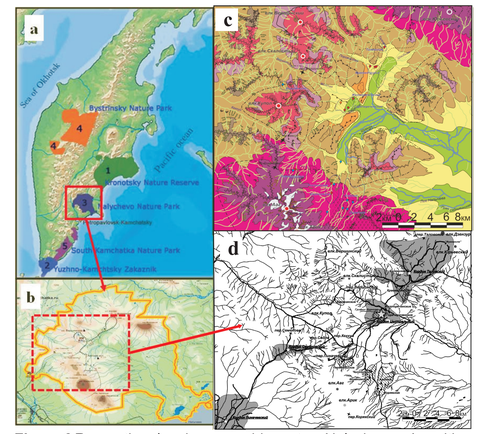


Table 6. RGP for different types of recreation activities (RGS Nalychevo, Kamchatka peninsula, Russia)

Types of recreation		Attractiveness	Risk	Potential
Balneal		2,29	1,78	Optimum
Hillwalking		2,00	1,78	Medium
Sports	Skiing	2,25	1,78	Optimum
	Trekking	2,36	1,78	Optimum
	Fishing	2,33	1,78	Optimum
	Rafting	1,75	1,78	Medium
Environmental education		2,50	1,78	Optimum

Legend

Genesis	uplands (200-500m)
Volcanic accumulative	
Polygenetic denudation-accumulative (fluvioglacial, debris flow, erosion etc.)	

Genesis	mountains	
	low (500-1000m)	medium (1-2 km)
Volcanic		
Glaciovolcanic		
Volcano-denudational		

Figure 6 Recreational and geomorphic system Nalychevo: a) position of Natural Park on Kamchatka peninsula, b) position of studied area, c) geomorphic scheme of central part of Nalychevo, d) scheme of recreational structure of Nalychevo.

4. REFERENCES

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