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GROWTH OF ECOGEOLOGICAL STRESSES IN MOUNTAINOUS GEOSYSTEMS IN THE CONDITIONS OF ACTIVATION MODERN DANGEROUS GEOMORPHODINAMICPROCESSES (on the example of Azerbaijan)

Abstract. The questions of negative influence of modern dangerous geomorphodinamicprocesses (MDGP) within the limits of the Azerbaijan are considered in the article. With the purpose of definition of a degree of influence of modern dangerous geomorphodinamicprocesses to the human and on an economic infrastructure the classification of territory by a degree of ecogeomorphological dangers and division into districts of ecogeomorphological areas was carried out.To evaluate the structure of modern dangerous geomorphodynamic processes we used the method of expert and statistical estimates of the area of propagation (intensity) of a process in geoecological region.Analysis of modern dangerous geomorphodynamic processes within ecogeomorphological regions of Azerbaijan, mountain geosystems that have been actively developed in the recent years for development of mountain tourism, agriculture, etc. allows us to conclude that in this region the most dangerous processes are earthquakes, landslides, mud flows, caving, sheet and river erosion, etc. They create overall ecodynamically stressed situation that requires to conduct advanced consistent, large scale expert evaluation of ecogeomorphological situation within the boundaries of each mountain ecosystem prior to its large-scale development for mitigations of the threats for human activities. The results obtained during the assessment of the effect of natural and man-caused factors on the stability of montane ecosystems may be used to forecast dangerous natural phenomena and to research geodynamical dangerous geomorphodinamic process not only in Azerbaijan, but also in other regions of the Alpine-Himalayan orogenic belt.

Keywords: of modern dangerous geomorphodinamic processes, ecogeological stresses, ecogeomorphological danger, Caucasus, Alpine-Himalayan montane system, tectonics, ecogeomorphological regions.

Introduction. In the end of the 20th century and beginning of the 21st century the mankind entered into the period of the severe environmental crisis caused by overall destabilization of geosystems of the Earth under the excessive technogenic pressure. The crisis resulted from social and economic processes occurring in different countries and regions of our planet which are constantly provoked by economic blunders and sometimes simply by the negligence and lack of professionalism with regards to the environment. The intensity and the scale of human impact on the geosystems continuously grow together with the development of technical equipment and power supply capacity. Another factors that aggravate environmental crisis are modern dangerous geomorphodinamic processes such as earthquakes, eruptions of volcanoes, floods, avalanches, mudflows, landslides, cavings, etc. that are frequently triggered by anthropogenic impact [1-7]. The understanding of the danger and magnitude of environmental crisis that attain global trends predetermined the resolution of the problems of interaction of nature and humans as one of the focus areas of studies. In that respect the least resistant to external impacts, the most geodynamically active and strongly crushed geosystems of the young alpine-type mountains that are developed in the area of intensive convergence of heterogeneous geoblocks – lithosphere plates are the most the most vulnerable. Such geosystems have unstable intercomponent links that are relatively easily broken in the result of intensification of external impact which destabilizes these systems. Then their balanced development is disrupted and the probability of disastrous events affecting large areas increases [8-11].

Azerbaijan is situated in geodynamically active zone. Its area is characterized by high potential possibility of development of dangerous endo- and exogeomorphological processes.

It is known that modern dangerous geomorphodynamic processes are developed almost everywhere within Alpine-type mountainous regions. According to available data their consequence significantly increases especially in the mountainous regions of Azerbaijan.

To determine the degree of development and impact of modern dangerous geomorphodynamic processes on people and on economic infrastructure within the mountainous regions of Azerbaijan we identified the classes of environmental hazard and ecogeomorphological regions with characteristic types of modern dangerous geomorphodynamic processes. However each of ecogeomorphological regions like all geosystems of Azerbaijan in general is significantly differentiated in terms of the range and degree of modern dangerous geomorphodynamic processes. Regions differently respond to modern dangerous geomorphodynamic processes occurring within their boundaries. The diversity of such reactions is very great both in terms of the strength and character of consequence for the nature, population and economy of the region.

The studied region has very complicated morphotectonic structure and it is marked by wide development of tectonic mantles, olistostromes, ophiolites, magmatic and mud volcanism and also by frequent change of the direction of strike of large morphological structures, activity of seismotectonic and modern tectonic processes, sharp differentiation of exogenic processes, etc.

Materials and methods. To evaluate the structure of modern dangerous geomorphodynamic processes we used the method of expert and statistical estimates of the area of propagation (intensity) of a process in geoecological region.

Results of research. Azerbaijan occupies the area of collision of such global tectonic plates as Eastern European and Arabian plates. Modern morphotectonic framework of this region was formed as a result of subduction of Mesotethys oceanic crust under Anatolia-Iranian (up to the Upper Cretaceous) and collision of Trans-Caucasian continental crust under the Scythian plate and Anatolia-Iranian plate under Trans-Caucasian plates [12]. The occurring different morphotectonic processes created such complicated structure area where both results of rifting (extension) and folding (compression) occur. Intensive but differentiated horizontal and vertical tectonic movements caused by them created rootless structures of the Greater and Minor Caucasus. Differentiation of compressions within the boundaries of the studied area determined the development of imbricated zones, brachiformmorphostructures and the intensity of numerous disjunctive and plicative dislocations determined thrusting of near-surface rock plates on each other which results in the formation of large near-surface overthrust sheets, olistostromes, olistoliths, etc. that strongly changed the morphology of the relief of this region.

Fault tectonics plays significant roles in the development of the modern relief of mountain regions of Azerbaijan under the conditions of the increase of tangential compression and extension. The mountain relief is especially complicated and mosaic in the areas of intersection of faults and dislocations of different direction and order. Large morphostructural blocks and their internal differentiation in the area of dislocations create complex, dynamic horizontal and vertical division of the area. It is expressed by the fact that in these areas intensive exogenic processes are almost always confined to weakened endogenically divided parts of the Earth's crust, i.e. to zones of development of faults. They are associated with the block tectonics and are limited by them [8]. It is found that in the orogenic regions almost all large river valleys are confined to complicated and multiorder grid of lineaments - faults (figure 1).

Within Azerbaijan the Major Caucasus forms large E-W mountain belt that stretches over several hundreds of kilometers from Tinov-Rosso mountain (3374 m) in the west to the Absheron Peninsula in the east. Tectonically the Major Caucasus is a large and complex structure mega anticlinorium composed mainly of sedimentary rock of Mesozoic, Paleogene, Neogene age and Quaternary sediments developed along river valleys, in intermount basins and on flat surfaces of watersheds. In the Major Caucasus high-altitude ridges alternate with massive plateaus, large intermount and intramount basins, high-altitude glaciers. The processes of ancient and modern erosion have a deep footprint almost everywhere in the mountain relief. They formed a dense grid of numerous differently oriented deep and narrow river valleys and gorges. In general the Major Caucasus is highly mobile geotectonic zone that composes one of the main seismically active belts of the Earth. Overall magnitude of the modern uplifts of the Major Caucasus in the area of peaks Bazardyuzyu, Shakhdag, Tufandag in Pliocene-Quaternary period exceeds 3600 m.

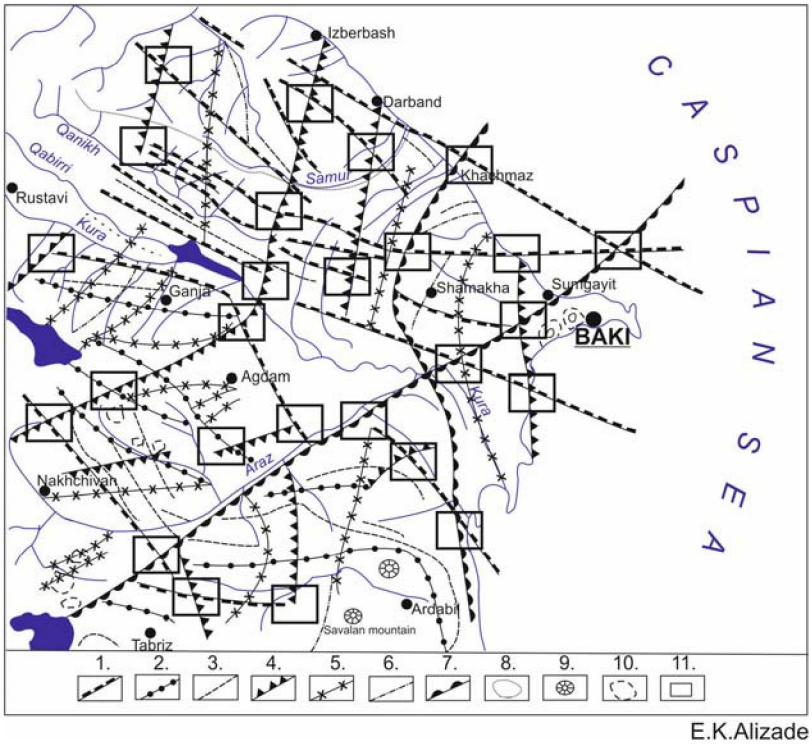

Figure 1 – Map of morphotectonic interpretation of lineaments of the Eastern Caucasus and the adjacent areas

Legend

Lineaments that correspond to faults (thrusts and overthrusts) of longitudinal (Minor Caucasus) direction: 1 - Regional deep faults that limit large longitudinal folding and block steps; 2 – Local faults corresponding to the boundaries of longitudinal folding and block morphological structures; 3 – Faults that determine the details of morphological structure.

Lineaments that correspond to faults (strike slips) of transverse (anti-Caucasus) direction: 4 – Regional deep faults that limit transverse megablocks; 5 – Local faults that correspond to the boundaries of transverse block segments; 6 – Faults; 7 – Large interregional diagonal volcanic centers; 8 – Contour of the circular object of Samur; 9 – Great volcanic centers; 10 – Ringed structures (tectonic and volcanogenic). 11 – Geodynamically stressed fields.

The above general geodynamic features of the relief of the Major Caucasus predetermined wide development of various modern dangerous geomorphodynamic processes within the boundaries of this mountainous region. Some of them (earthquakes, landslides, cavings, deep and surface erosion, etc.) during their development create a tense ecodynamic situation.

Taking into these data we divided the area of the Major Caucasus into the following ecogeomorphological regions:

1. North-Eastern slope of the Major Caucasus;
2. Southern slope of the Major Caucasus;
3. South-Eastern part of the Major Caucasus.

North-Eastern Slope of the Major Caucasus - class 3 - high ecogeomorphological danger. North-eastern slope of the Major Caucasus is situated to the north of the watershed line of the Major Caucasus Mountain Range and stretches to the coast of the Caspian Sea. It covers the northern slope of the Major Caucasus Mountain Range, Bokovoy Ridge and adjacent area. Four structural and denudation longitudinal steps are defined: Samur-Devechy, Gusar-Siyazan, Shakhdag-Khyzy, Tufan [8,12,13, etc.]. Geodynamically active heterogeneous overthrust-folding morphological structures with characteristic set of modern dangerous geomorphodynamic processes [14,15] are defined within the boundaries of the north-eastern slope. Nival caves and deep depressions of caroid type, kars, circuses, trough valleys, snow erosion are developed in high-altitude zones that is characterized by high intensity of divisions and wide development of nival-glacier relief forms. Areal landslides, stream landslides, collapsing landslides (basins of rivers Gilgilchay, Babachay, Atachay, slopes of Nokhular, Sokhyub, Yerfin, Khaltan syncline basins), avalanches, rockslides, solifluction and defluction processes are common [16,17,18] (figure 2).

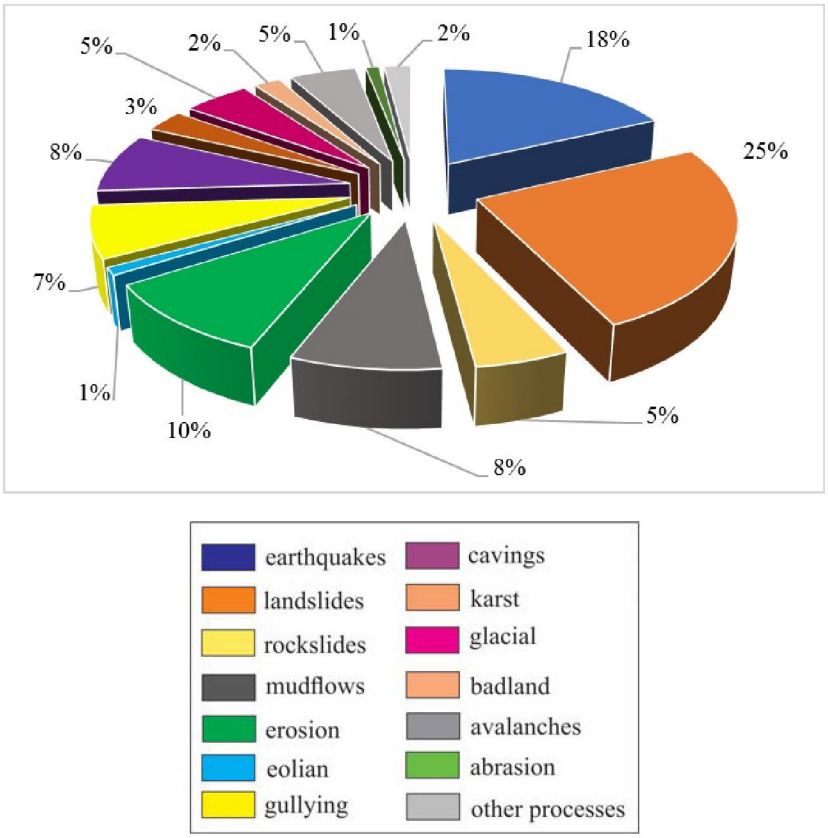

Figure 2 – Structure of modern dangerous geomorphodynamic processes within the boundaries of north-eastern slope of the Major Caucasus

Southern Slope of the Major Caucasus - class 3 - high ecogeomorphological danger. The southern slope of Major Caucasus Mountain Range in Azerbaijan is situated between Mazymchay river in the west and Girdymanchay river in the east. Low-hill terrain, medium mountains and highland is distinct within its boundaries. It is intensively divided by transverse river valleys separated by numerous branches of Major Caucasus Mountain Range that have erosion origin and complex orographic structure. Tectonically the southern slope corresponds to Tufan anticlinorium and Zagatal-Govdagsynclinorium composed of Jurassic and Cretaceous shale, sandstone, limestone that intensify weathering, denudation, erosion processes and accumulation of thick loose sediments that participate in formation of different relief features and mudflows [19]. The earthquake magnitude reaches 8-9 especially in the area of intersection of active faults. High seismicity of the area creates stresses in the relief which intensifies modern dangerous geomorphodynamic processes. Nival-glacial and gravitational processes (avalanches, landslides, cavings, trough valley, karst, circuses) occur in highland area on the background of intensive neotectonic uplifts. Erosion-denudation and gravitational processes (mudflows, landslides) prevail in the middle mountain belt. Erosion processes prevail in low-mountain terrain area where mudflow, alluvial-proluvial and landslide formation accumulate along river valleys (figure 3).

South-Eastern part of the MajorCaucasus – class 2 – medium ecogeomorphological danger. Mountainous Shirvan geomorphologically is a part of single Shemakha-Gobustan zone. Geotectonically it corresponds to two tectonic zones - Zagatala-Govdag in the north and Shemakha-Gobustan in the south. Elevations range from 200-300 m to 2200-3629 m. Orogenic processes, fault block movements also occur in the modern time which evidenced by earthquakes with magnitude of 9 and greater. Modern dangerous geomorphodynamic processes have complex regularities of areal propagation. Seismogravitational, gravitational, erosion-denudation, etc. processes are prevalent. Landslides, slips, badland (the valley of the middle course of the Sumgaitchay river and south-western slope of Lyangyabiz ridge), clay karst are common. A number of mud volcanoes are located here – Demirchi, Astrakhanka (Gyzmeydan), etc. [20, 21].

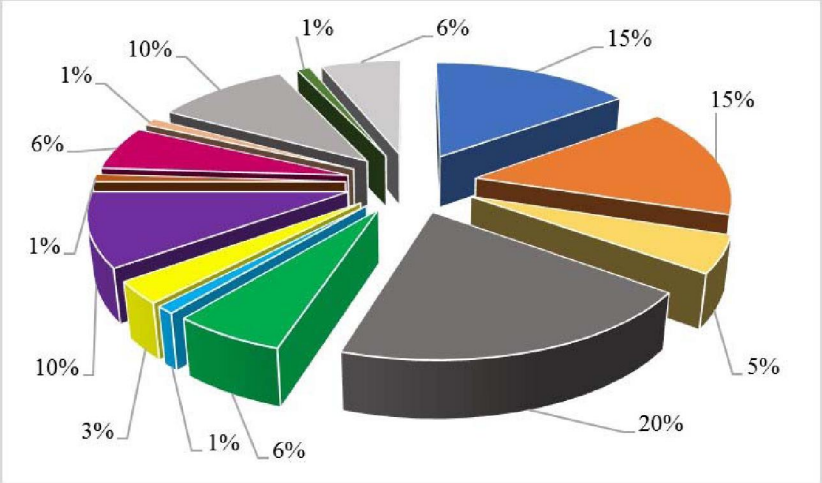

Figure 3 – Structure of modern dangerous geomorphodynamic processes within the boundaries of southern slope of the Major Caucasus

Arid-denudation processes and relief forms created by them (badland, clay karst, etc.) become common in Gobustan (in its south-eastern part). Mud volcanoes Touragay (400 m), Greater and Small Kyanizadag, Cheildag, Davalidag, etc. are situated in superimposed Jeyrankechmez syncline depression. Earthquakes magnitude reaches 7-8 (figure 4).

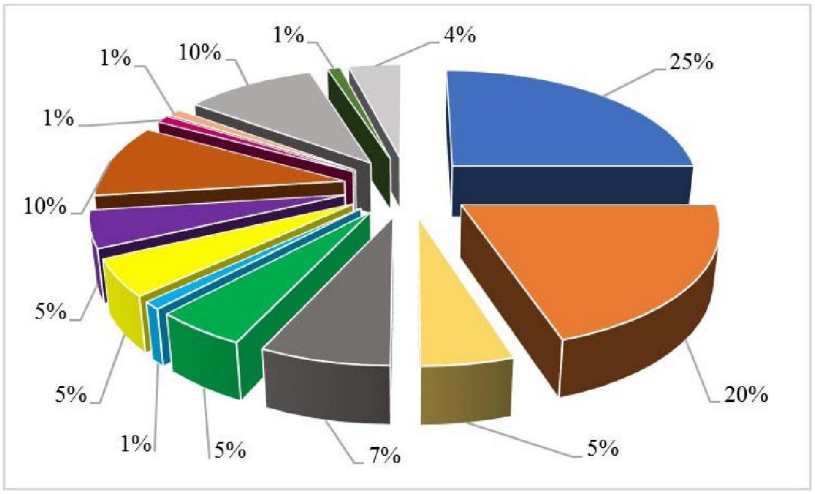

Figure 4 – Structure of modern dangerous geomorphodynamic processes within the boundaries of South-Easternof the Major Caucasus

The area of Minor Caucasus was divided into the following ecogeomorphological regions:

1. North-Eastern slope of the Minor Caucasus;
2. South-Eastern part of the Minor Caucasus.

North-Eastern Slope of the Minor Caucasus - class 2 - medium ecogeomorphological danger. North-eastern slope of the Minor Caucasus includes the slopes of Shakhdag and Murovdag ridges, Shamkir dome-shaped upland, Bashkend-Dastafyur basin. On the side of Kura depression it is bounded by the Pre-Minor Caucasus deep fault.

Gazakh ridge, Shamkir uplift, Pant ridge and Geygel uplift are large morphostructural elements of the north-eastern slope of the Minor Caucasus.

The lithology of composing rock plays a significant role in the plasticity of the modern relief. Their resistance to denudation is attributable to syncline peak Kyapyaz (composed of Upper Jurassic limestone), syncline plateau within Baskend-Dastafyur basin in the interfluve of Dastafyurchay and Gyandzhachay rivers and monocline ranges of peaks Ganly, Gamyshly, Murtuzdag in Shakhdag ridge.

The watershed of Murovdag ridge is strongly divided. The rocky-alpine relief is developed here. Nival-frost and gravitational processes prevail here facilitating significant renewal of slopes.

Ancient glacial relief forms are well preserved in the near-watershed part of Shakhdag and Murovdag ridges at the elevations of over 2400 m. A series of kars located at the altitudes of 2400 and 2600 m is developed in the head of Shamkirchay and Gyandzhachay rivers. Kars were preserved at elevations 2800, 3100 and 3280 m in the area of Gyamyshdag mountain. To the east the kars are preserved approximately at the same elevations – up to Murovdag peak. These forms of glacial relief belong to Upper Quaternary glaciation of the Minor Caucasus.

The elevation of landslide areas ranges from 1000 to 3000 m. Maximum atmospheric precipitation (600-900 mm) is confined to this strip. Landslides and mud flows are widely spread within the largest basins (Khoshbulag, Dastafyur and Novosaratovskaya) and their sides. They are especially well traced in the river terraces of valleys of Zeyamchay, Gyandzhachay, Shamkirchay, Kyuryakchay rivers and their tributaries. Dastafyur basin and closely located Khoshbulag basin are abundant in large mud flows-confined their southern sides. Numerous mud flows are observed in the area of Geygel lake and at the large benches near Kyapyaz mt. and in the head of Buzlukh river. A large technogenic landslide with width of 520 m, height from 5 to 30 m and over 4 mln. m^3 of landslide material was formed in the southern part of Dashkesan mt. due to improper extraction of waste rock. Lateral speed of the movement of the landslide has been 0.36 cm/day since 1990 due to freezing of soil in winter and melting in spring, snow melting, seismic movements.

Landslides are especially common in the head of Gyandzhachay-Shamkirchay rivers and in the adjacent areas. They significantly reduce the area of mountain meadows. Therefore, exposed, strongly degraded and potentially geodynamically dangerous areas expand. Intensive deforestation in the middle-mountain area of the studied region intensified landslide dislocations.

Cavings are confined to the slops of monocline ranges and uplands in the north-eastern periphery of the Minor Caucasus which are composed of sedimentary and volcanogenic-sedimentary rock. The cavings in the northern slopes of Kyapyaz mountain are gravitational and tectonic formed during disastrous seismic activations (for example, Geygel lake was formed in 1139).

Rock slides are spread within the boundaries of highland and middle-mountain belts but they also occur on the slopes of ridges. They are also confined to the sides of valley of Zeyamchay, Gyandzhachay, Shamkirchay rivers, etc. Earthquakes magnitude reaches 9 and more (figure 5).

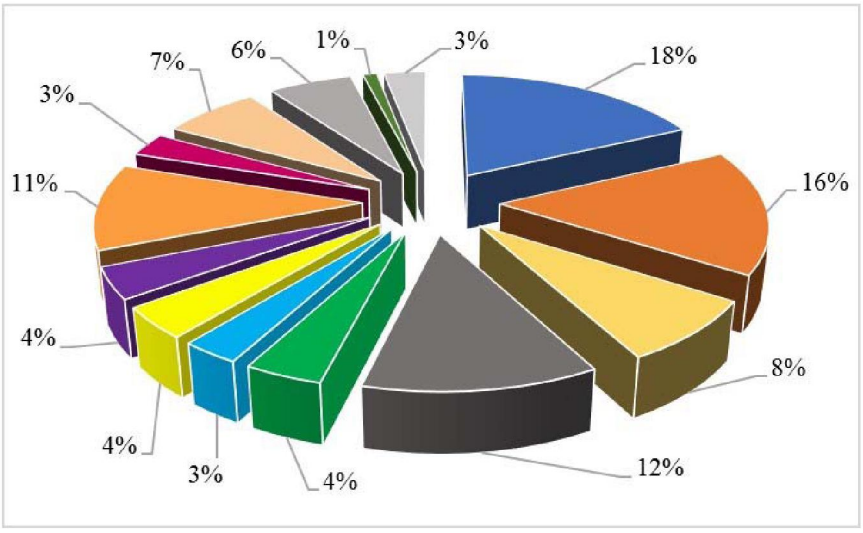

Figure 5 – Structure of modern dangerous geomorphodynamic processes within the boundaries of north-eastern slope of the Minor Caucasus

South-Eastern Part of the Minor Caucasus – class 2 – medium ecogeomorphological danger. South-eastern part of the Minor Caucasus is represented by Garabakh ridge and Garabakh volcanic upland.

Garabakh ridged is intersected by Terter, Khachinchay, Gargarchay transverse deep faults and their branches along which strike-slip movements occurred in the modern stage. Geomorphological consequences of faults and differentiated movements along the faults is sharp asymmetry of the slopes of Garabakh ridge and lateral deformation of its watershed where highly uplifted rocky massifs being partially the centers of Mesozoic volcanism alternated with deeply submerged through valleys and pass saddles with gradient ranging from 300-550 m to 700-900 m.

Transformation of morphostructural plane and river systems significantly affected modeling of morphological structures that complicated the conditions of development of their morphological sculptures [13].

Landslides occur in the bedrock in the basins of Terter, Akeri rivers. In the central part of the Minor Caucasus landslides are associated with ophiolite strip. Serpentinite and serpentinitized rock that is common here is characterized by strong crushing, intensive fracturing and weak resistance to denudation. Under favorable conditions separate blocks and masses of this rock move along shear planes and tectonic slipping planes which well observed on the southern slope of Murovdag ridge in the head of Seyudlyuchay river, Levchay, Bulangysu river, etc. Cavings and talus material are widely spread in the area of Gyrkhyz, Sary-Baba, Beyuk-Kirs, Ziyarat mountains, etc.

The main features of Garabakh volcanic upland are determined by Upper Pliocene Quaternary volcanism and the elements of its relief are determined by modern subnival-denudation and ancient glacial processes. Beyuk, Ishygly, Gyzylbogaz and Kechaldag massifs composed of Late Pliocene lavas of different composition have dissected relief.

Lava sheets form highland plateaus with steep slopes and low (150-100 m and less) relative elevations. Lava sheets (Terter, Minkyand, Bazarchay, Pyarichyngyl, Gyrmyzydag, etc.) were formed both in river valleys and on the plateau surface. Almost lava streams have stepped surface attributable to repeated lava outflows. Holocene lavas are characterized by piles of boulders, blocks (sometimes up to 305 cm) that form felsenmeer – chyngyly. Pyarichyngyl which is the largest boulder field within Trans-Caucasian upland is situated here.

Exaration and accumulation forms of the Quaternary glaciation are preserved in the highland part of the upland. They are represented by kars, circuses, trough valleys, moraine hills, knobs, ridges, inter-moraine, closed lows which are more widely developed in BeyukIshygly and Gyzylbogaz massifs, in the head of Terter river (Garakhach, Aiychyngyl) and Eastern Arpachay river (Sarymsagly river). Exaration glacial forms (kars, circuses, through valleys) are have absolute elevations 2900-3300 m, accumulation feature have elevations of 2600 m (figure 6).

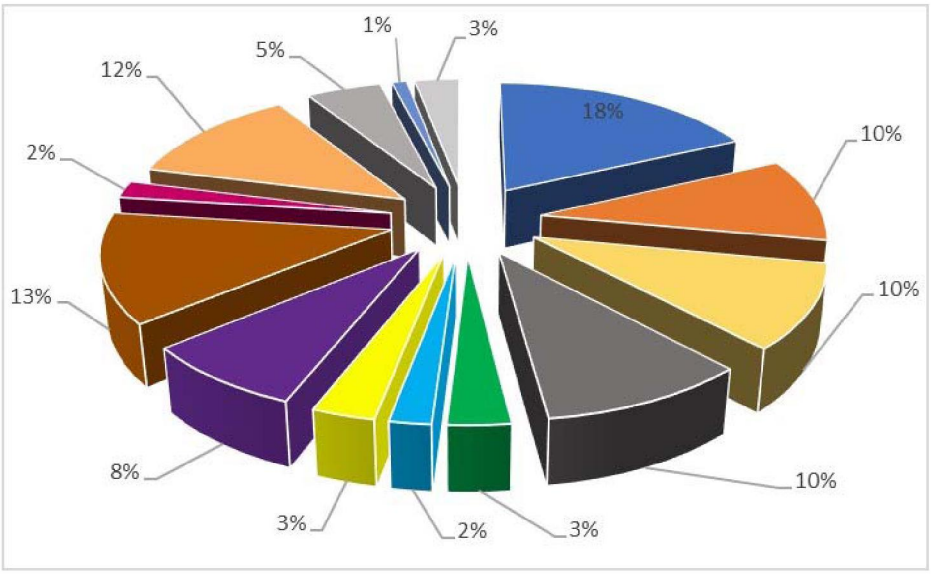

Figure 6 – Structure of modern dangerous geomorphodynamic processes within the boundaries of south-eastern part of the Minor Caucasus

Nakhchivan mountain structures – class 3 – high ecogeomorphological danger. Mountain structures of Nakhchivan surround Azerbaijan part of Middle Arazintermount trough in the north-east. They are represented by Zangezur, Daralayaz ridges and their numerous side branches.

Average height of Zangezur ridge is 3200 m (maximum height of Gapydzhyg mountain is 3904 m). The slopes of the ridge and peak-shaped tops are covered by coarse colluvial sediments that locally form rock flows.

The relief of highland Zangezur and Daralayaz ridges is characterized by extremely intensive dissection, presence of rock zone with cone-shaped mountain peaks, narrow, V-shaped deep weakly terraced valleys, gorges, canyons. Glacial forms (Quaternary) are represented by circuses, kars, through valleys (locally hanging valleys), kar lakes, morains.

Nival processes, intensive physical weathering prevail in the highland belt that results in wide-scale development of coarse detrital accumulations. The latter ones and partially ancient moraines are the main sources of mud flows. Intensive frost destruction (cavings) is observed in the south-east and in the eastern slopes of Sinor, Kyukyudag, Kechaldag, Salvarty, Gazangeldag, Gapydzhyg, Sapardere, Yaglydere, Aychyngyl mountains, etc.

Middle-mountain belt (1400-2400 m) is characterized by intensive erosion that determined presence of deep river valleys here along which cavings and rock slides are deveoloped. Ancient glacial forms are developed in the head of Bichyanyakchay, Gyumurchay, Gilyanchay, Alindjachay, Nakhchivanchay, Duilunchay rivers. They are represented by strongly destroyed kars, circuses, kar lakes, moraines and fluvioglacial sediments.

The region is characterized by intensive mud flow processes. The most mud flow bearing rivers are Duilunchay, Aylischay, Ordubadchay, Ganzachay, Ketamchay, Kilitchay. Total area of basins of the most mud flow bearing rivers (Ordubadchay, Ganzachay, Ketamchay and Kilitchay) in the areas where mud flow and stone flows mainly occur reaches 390 km^2. The main part of this zone covers south-west slope of Zangezur ridge. The basin of the Ordubadchay river is composed of Upper Eocene–Oligocene felsic intrusive rock that form the slopes of the southern, south-western exposure. In the result of intensive weathering loose material is formed that feeds structural mud flows. Alinjachay and Gilyanchay rivers are also mud flow bearing. Within the studied are the basins of mud flow rivers located in the middle mountain belt do not have forest cover and grass and sparse shrub vegetation does not form dense cover. For this reason structural mudflows occurring here drive significant amount of material that is deposited in intramountain basins or within the boundaries of piedmont inclined plains.

The region is characterized by high seismicity – magnitude up to 8 (Gyunnyut-Gapydjyg area – magnitude 9 and greater) (figure 7).

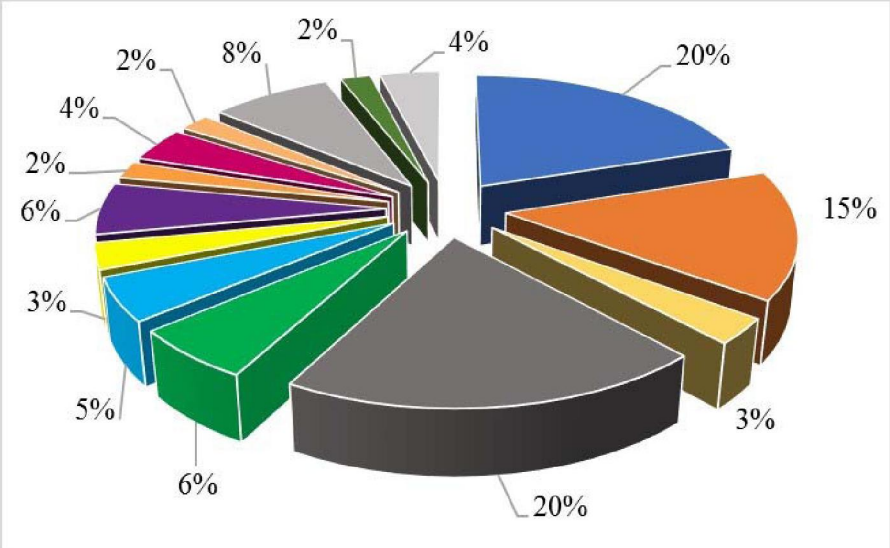

Figure 7 – Structure of modern dangerous geomorphodynamic processes within the boundaries of Nakhchivan

The Talysh mountains – class 2 – medium ecogeomorphological danger. The Talysh mountains occupy the extreme south-eastern part of Azerbaijan. MaximumheightoftheTalyshmountains – Kemyurkeymt. (2493 m).

The mountain part of Talysh is characterized by numerous transverse typical erosion ridges stretching over many kilometers in the form of narrow dividing ridges. They are the most common in the basin of Tangyarud, Astarachay and other rivers where the degree of erosion dissection is the highest. The Talysh and Peshtasar ridges are characterized by the most intensive dissection. It is determined by active physical weathering due to prevalence of arid conditions of relief formation.

Significant energy of denudation processes led to distinct determination of the relief by bedding and lithology of rock. Landslides frequently forming circuses in the riverheads are quite common in the mountain part of Talysh. The development of modern exogenic relief forming processes depends on the elevation of the relief, recent and modern tectonic movements, exposure of slopes, climate conditions, etc.

Physical weathering is intensively developed in the north-western part of Talysh that is associated with accumulation of clastic material on the slopes. Aeolian processes are developed here. The most typical forms of deflation relief are blowing off residual outcrops. Honeycomb weathering can be observed on some parts of slopes.

Chemical weathering is intensively developed in piedmont area to the south of the Lyankyaranchay river. It results in accumulation of diluvial loam that forms thick cover over densely forested foothill slopes.

Within the boundaries of Talysh landslides are mainly developed in the low mountain belt where there is sufficient atmospheric precipitation and clay rock is developed.

Landslides are confined to slopes with rather thick layer of diluvial sediments or that are composed of clay sediments. Landslides are mostly developed within the boundaries of Yardymlin depression where they are confined to the slopes composed by Maikop sandstone and shale sediments that do not have forest cover. Landslides within Yardymlin depression cover slopes of almost all river valleys. Landslides here destroy slopes transforming them into unsuitable land and interrupt transport communication.

Caving processes are widely developed on the slopes of Talysh and Peshtasar ridges. Rock slides (rock debris) are mainly developed in the middle mountain and low mountain belts of the Talysh Mountains, sand and clay slides are developed within Yardymlinintramount basin. Mudflow are formed rarely, mud content is low.

Earthquake magnitude is up to 8 (figure 8).

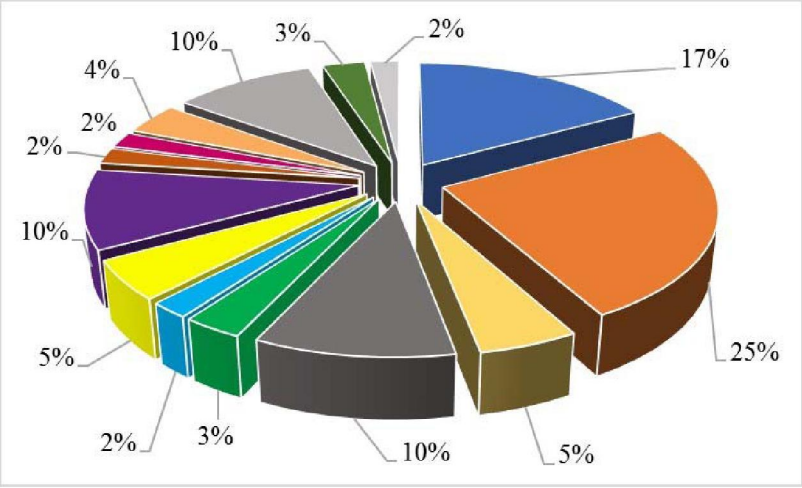

Figure 8 – Structure of modern dangerous geomorphodynamic processes within the boundaries of the TalyshMountains

Conclusion. Brief analysis of modern dangerous geomorphodynamic processes within ecogeomorphological regions of Azerbaijan, mountain geosystems that have been actively developed in the recent years for development of mountain tourism, agriculture, etc. allows us to conclude that in this region the most dangerous processes are earthquakes, landslides, mud flows, caving, sheet and river erosion, etc. They create overall ecodynamically stressed situation that requires to conduct advanced consistent, large

scale expert evaluation of ecogeomorphological situation within the boundaries of each mountain ecosystem prior to its large-scale development for mitigations of the threats for human activities.

The obtained results allow analyzing in detail the factors that facilitate the occurrence of dangerous natural phenomena in the mountainous regions of Azerbaijan. Similar to all orogenic zones, these areas are characterized by an increasing rate of dangerous destructive natural phenomena, which is caused by an increased effect of both natural and man-caused factors. The analysis of the manifestations of most active (with catastrophic consequences) destructive natural processes and the morphotectonic structure of the studied area showed that the their occurrence and maximum intensity was confined to the weakest plexuses of mountains – intersections of faults and fractures of various directions and orders.

Due to the complex interaction of natural and man-caused factors that cause the development of dangerous geomorphodynamic processes in mountainous regions, it is very difficult to determine the specific role that each of these processes plays. Therefore, these processes were considered in combination when predicting the risk of occurrence of dangerous natural phenomena. This approach toon into consideration the entire set of factors, such as the intensity of the studied phenomenon, the seismic activity of the area, manmade influence, erosion stratification, lithological composition of rocks, and the dynamic of the process.

The scientific and methodological approach and the results obtained during the assessment of the effect of natural and man-caused factors on the stability of montane geosystems by the example of Azerbaijan may be used to study geo-dynamically dangerous geomorphodynamic processes in other regions of the Alpine-Himalayan orogenic belt, especially in France, Austria, Italy, Balkan countries, Switzerland, Russian Federation, Tajikistan, Kyrgyzstan, and other countries.

The obtained results can be used to plan and perform economic activities, determine and minimize the hazards and risks of occurrence of dangerous natural phenomena, and forecast such phenomena in the future.

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ЗАМАНАУИ ҚАУІПТІ ГЕОМОРФОДИНАМИКАЛЫҚ ПРОЦЕСТЕРДІҢ БЕЛСЕНДІЛІГІ ЖАҒДАЙЫНДА ТАУ ГЕОЖҮЙЕЛЕРІНДЕГІ ЭКОЖҮЙЕЛІК КЕРНЕУЛЕРДІҢ ӨСУІ (мысалы, Әзірбайжан)

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РОСТ ЭКОГЕОЛОГИЧЕСКИХ НАПРЯЖЕНИЙ В ГОРНЫХ ГЕОСИСТЕМАХ В УСЛОВИЯХ АКТИВАЦИИ СОВРЕМЕННЫХ ОПАСНЫХ ГЕОМОРФОДИНАМИЧЕСКИХ ПРОЦЕССОВ (на примере Азербайджана)

Аннотация. В статье рассматриваются вопросы негативного влияния современных опасных геоморфодинамических процессов (СОГП) в пределах Азербайджана. С целью определения степени влияния современных опасных геоморфодинамических процессов на человека и на экономическую инфраструктуру была проведена классификация территорий по степени экогеоморфологических опасностей и деление на районы экогеоморфологических районов. Для оценки структуры современных опасных геоморфодинамических процессов использовался метод экспертных и статистических оценок площади распространения (интенсивности) процесса в геоэкологическом регионе.

Анализ современных опасных геоморфодинамических процессов в пределах экогеоморфологических районов горных систем Азербайджана, которые активно осваиваются в последние годы для развития горного туризма, сельского хозяйства и др., позволяет сделать вывод, что в этом регионе наиболее опасными процессами являются землетрясения, оползни, селевые потоки, эрозия рек и т.д. Они создают общую экодинамически напряженную ситуацию, которая требует проведения последовательной крупномасштабной экспертной оценки экогеоморфологической ситуации в пределах границ каждой горной экосистемы до ее крупномасштабного развития, а также для смягчения последствий угрозы для человеческой деятельности. Результаты, полученные в ходе оценки влияния природных и техногенных факторов на устойчивость горных экосистем, могут быть использованы для прогнозирования опасных природных явлений и исследования

геодинамически опасных геоморфодинамических процессов не только в Азербайджане, но и в других регионах Альпийско-Гималайскогоорогенного пояса.

Ключевые слова: современные опасные геоморфодинамические процессы, экогеологические стрессы, экогеоморфологическая опасность, Кавказ, Альпийско-Гималайская горная система, тектоника, экогеоморфологические районы

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