

IMPACT OF NATURAL DISASTERS ON THE DEVELOPMENT AND ORGANIZATION OF HIGHWAYS IN AZERBAIJAN REPUBLIC

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Abstract

In the article, the urgency of investigation of adverse effect of natural disasters on transport network of Azerbaijan Republic in terms of economy and social-geography is substantiated. In accordance with the scope and functions of the research work, the analysis and study of relevant risk of natural disaster in the current condition are carried out. Definite kinds of natural disasters that occur and is widespread in the territory of Azerbaijan, are negatively affecting on the composition of highways, and also the transportation of goods and passengers at regional and local scale, which is studied in detail. Natural disasters are responsible for damage exposed to the transportation of goods and passengers at highways as well as the injury made on the population and economic activity. Scale of encompassment of these natural disasters, and also the ways of relevant preventive measures are shown in the article. Contemporary scientific and technological opportunities allow build effective dams, flood-directing and other engineering appliances at transport junctions, bridges, tunnels and ferry areas. The corresponding proposals are advanced in the research work.

Keywords: natural disaster, flood, inundation, earthquake, landslip, economic, region

Highway network and also communication settlement are regularly exposed to damage because of natural disasters in the territory of Azerbaijan Republic. Motor transport is one of areas of transport, characterized with high maneuvering and speed transportation. It is economically efficient activity in terms of transportation for long distance, but also is sensitive to natural disasters. Economic and geographical peculiarities of countries and regions as well as natural disasters that take place in these territory directly affects to the construction of highways, turnover and structure of transportation of goods and passengers, and also the configuration of transport network and directions of transportations.

According to State Statistical Committee of Azerbaijan Republic, the total length of used highways is 14,8 thousand km, of which 330 km, or 3,0% are of first grade, 1128 km or 8,0% are of second grade, 3764 km or 26,0% are of third grade, 8724 km or 59,0% are of fourth grade, 905 km or 6,0% are of fifth grade (4).

In 2012, 141,7 million persons and 118,1 million ton of goods in average were transported via facilities of motor transport in the country. 21 km-long or 7,0% of highways of first class were exposed to damage due to natural disasters. The corresponding indicators were 86,8 km or 8,0% by second-class, 386 km or 11% by third class, 1234 km or 15% by fourth-class, and 220 km or 25% by fifth-class of highways. The length of highways, regularly suffering from destructive natural events equated to 556 km (or 13% of the total length) in the Sheki-Zagatala economic region, 184 km (14%) in the Nakhchivan economic region, 273,6 km (11%) in the Ganja-Gazakh region, 422,3 km (10,1%) in Aran, 175 km (10%) in Guba-Khachmaz, 85 km (7,0%) in Mountainous Shirvan, 73 km (4,0%) in Lankaran-Astara, and 27 km (5,0%) in Yukhari (Upper) Karabakh.

In Azerbaijan, the highways of international importance are Baku-Aghstafa-Tbilisi (Western route), Baku-Astara (Southern route), Baku-Alat-Julfa (South-western route) and Baku-Khachmaz-Derbend (Northern route). Different parts of these highways are periodically being affected by natural destructive events such as flood, inundation and landslide. As a result of these destructions, disruptions in transportation of goods and passengers and big economic losses are being faced. Destructive power is not the same everywhere, and regions are different for volume of the relevant economic damage. In this regard, analysis of influence of on motor transport, occurring due to natural disasters in Azerbaijan, is more urgent. Physical and geographical condition, and structure of economy is very different in the regions of Azerbaijan, and therefore, the relevant influences and quantitative indicators are not the same.

The length of highways that are exposed to the influence of natural destructive events is as follows:

in the Absheron economic region, it is 6 km by highways of state- and 14 km-long of local importance; in Sheki-Zaqatala region, the corresponding indicators are 22 km and 254 km; in Ganja-Gazakh, these indicators are 14 km and 36 km; in Lankaran-Astara, 2 km and 8 km; in Nakhchivan Autonomous Republic 24 km and 120 km respectively. As for other regions, 74 km-long highways in Mountainous Shirvan, 70 km-long highways in Kalbajar-Lachin, and 134 km-long highways in Yukhari Karabagh face damage due to flooding.

It was considered that the total length of highways in Azerbaijan has made up 24,4 thousand, but currently 4684 km-long highways are useless in connection with occupation by Armenian military forces. The rest highways are under serfdom of local municipalities. Besides with officially registered and permanent highways, automobile roads and other highways under municipal subordination also exists in the territory of Azerbaijan. Loading rate of usable lands and areas of agricultural importance is analyzed. In average, loading rate is registered as 35 ha of usable lands and 21 ha of planting areas per 1 km of highway in the country. As for municipal lands, the corresponding indicators make up 49 ha and 29 ha per 1 km of highways. Loading rate of highways is different in the regions of Azerbaijan. Thus, this indicator is higher in the Aran, Nakhchivan and Sheki-Zagatala economic regions. The carried studies show that the intensity rate of use of territory is different in the regions.

The highways from rural areas to centers of administrative territorial units are being used more intensively in Aran, Nakhchivan and Sheki-Zagatala. The condition of these highways is not satisfactory due to negative influence of natural disasters. The average distance from between rural settlements and cities-centers of administrative regions is 22,3 km in the country. The corresponding indicator is 23-28 km in the Guba-Khachmaz, Absheron, Aran, Ganja-Gazakh and Mountainous Shirvan economic regions. As is seen, in the mentioned regions, the length of highways is higher compared to the corresponding indicator for the country. 70% of total length of these highways is asphalted, 21% is covered with stone and gravel, and 9% is soil roads.

Over 18% of highways constructed in the rural areas, are regularly being exposed to the influence of natural destructive events, in particular in spring, autumn and winter seasons. 29% of existing highways in

Lankaran-Astara and 27% of existing highways in Guba-Khachmaz are in need of building- and reconstruction works. The necessity of implementation of relevant measures (concerning highways of local importance) is more urgent in the rural territories. In order to keep relations between centers of administrative regions and villages, 14 km-long highways must be reconstructed, and measures of protection against natural disasters must be implemented.

The share of local highways of municipalities among total highways is much more in Aran, Absheron, Sheki-Zagatala, Ganja-Gazakh and Guba-Khachmaz economic regions compared to the corresponding indicator for the country. Automobile roads of municipalities connect mainly rural settlements and planting fields. In the meantime, only 7,0% of these roads are asphalted while 27% are covered with stone and gravel, and over 67% are soil roads. 59% or 32 km-long municipal roads are of low quality, and this factor impedes traffic during spring, autumn and winter seasons, and also hamper establishing stable economic relations. The problem is urgent particularly in the Aran, Guba-Khachmaz and Mountainous Shirvan economic regions where the percentage of unsuitable municipal highways is higher.

According to results of survey, carried out among heads of local municipal institutions and population, transportation relations between villages and centers of administrative regions is not reliable because of natural destructive events. The main reason in the emergence of such condition is the absence of water-conductive equipment, bridges and tunnels at valleys of large and small rivers. Only 69% of villages and 72,6% of the population is able to use public transport at satisfactory level in the regions of Azerbaijan during spring, autumn and winter. For 16% of villages, regional centers are reachable via two runs, and for 19% of villages, only one run a day is available. 180 rural settlements (5,0%) have not such opportunity (5).

In particular, challenges are faced as usual by rural settlements and their automobile roads where natural destructive events regularly occur. Flooding inundations and landslips are more responsible for damages at transport facilities, and during transportation of goods and passengers. In this connection, motor transport is not well-developed in most of villages. Population of 58% of rural settlements is being obliged to use private cars.

Demographic loading in villages of each economic region is reflected by indicators such as the number of families and their members, the average number of families, the length of highways between villages and cities-regional centers, the length of highways in the territory of municipalities and also heaviness grade of relevant damages. Out of 554,2 thousand km long municipal highways, 32,2 thousand km or 6,0% are functioning under the risk of natural disaster in rural territories. 37% of municipal highways in the villages of the Aran economic region are functioning under such risk. The corresponding indicator is 20% in Guba-Khachmaz, 15% in Ganja-Gazakh, 10% in Sheki-Zagatala, 9% in Lankaran-Astara, 8,0% in DaghligShirvan, 2,0% in Nakhchivan Autonomous Republic, 2,0% in YukhariKarabagh and 1,0% in Absheron.

Table 1
The condition of highways in the settlements of Azerbaijan

| Name of economic regions | Demographic indicators | | | Length of municipal highways | |
|--------------------------|------------------------|--------------------------|---------------------------------------|------------------------------|--|
| | Number of families | Number of family members | The average size of families (person) | Total | Length of highways, exposed to natural disaster (km) |
| Absheron | 7037 | 33296 | 5,0 | 597.6 | 166,2 |
| Guba-Khachmaz | 102208 | 380575 | 4,0 | 8149.3 | 6146,5 |

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|------------------------------|---------|---------|-----|---------|---------|
| DaghligŞirvan | 56052 | 236452 | 4,0 | 4095 | 2546,5 |
| Sheki-Zagatala | 118524 | 458592 | 4,0 | 6725,8 | 3181 |
| Aran | 277970 | 1236166 | 5,0 | 18265,1 | 11739,3 |
| Ganja-Gazakh | 180699 | 715435 | 4,0 | 10076,6 | 4737,6 |
| YukhariKarabagh | 29347 | 135321 | 5,0 | 1247 | 551 |
| NakhchivanAutonomus Republic | 78782 | 772771 | 3,0 | 1309 | 435 |
| Lankaran-Astara | 173771 | 745230 | 4,0 | 4948,9 | 2644,7 |
| Azerbaijan Republic | 1024390 | 4213838 | 4,0 | 55414,3 | 32147,8 |

Sources: Data on “Result of disposable survey of the condition of highway- and communication network in rural areas” (State Statistical Committee of Azerbaijan Republic). Baku. 2003, pp. 302-305.

In Nakhchivan Autonomous Republic, the following highways and small automobile roads see more damage because of floods:

Ordubad-Julfa, Nakhchivan-Shahbuz, Shahbuz-Bichanak, Ordubad-Ganja, Channab-Duylun, YukhariAyilis-AshagiAyilis; Dizeh-Vanand; Dasta-Khanagha; Sabirkend-Bash Dizeh; Bilev-Behrud; Unus-Kalaki-Dirnis; Ganza-Anabad; Nusnus-YukhariAndamij; Aza-Azadkend, Jamaldin-Arazin; Bananiyar-Goydere; Gazanchı-Milakh; AşağıBuzgov-YukhariBuzgov; Selesuz-Dayagli; Garababa-Ayrinj; Bichanak-AshagiGishlag; Akhura-Hemzeli; Əliabad-Chalkhangala; Garabaghlar-Chalkhangala, YukhariYayji-Karimguluzadeh, Akhura-Hamzali; Aliabad-Chalkhangala; Garabaghlar-Chalkhangala.

In Sheki-Zagatala region, the total length of highways makes up 1801 km, of which 704 km or 39,1% fall to the share of territories of high risk of flooding. Besides with this, nearly 300 km-long highways face damage in the areas of the Sheki-Balaken, Sheki-Gakh, Oghuz-Gakh, Oghuz-Sheki, Zagatal-BirinjiTala, Gabala-Vandam highways and also 300 km-long soil roads, connecting about 70 villages are exposed to flooding more. In particular, the highway from the First Shamakhi-Ismayilli-Sheki-Balaken highway to the Georgian border through the territories of the DaghligShirvan and Sheki-Zagatala regions faces more damage. This highway lies out of regional cities and on a number of bridges in order to be protected from floodings. These areas also are exposed to the influence of flooding. The bridges, constructed on the Kishchay, Talachay, Balakanchay and Kurmukchay rivers play significant role in preventing negative impact of flooding. Highways near Shinchay and Mukhakhchay are crossing mainly the valleys of these rivers.

The above-mentioned First Shamakhi-Ismayilli-Sheki-Balaken highway is functioning under the threat of flooding, and therefore, is a highway of local importance rather than international. In this connection, the second Khaldan-Zagatala-Balaken highway has been built in paralel to the first. The second highway faces less threat compared to the first highway. Sometimes floods may not destroy highways and bridges, but they may be responsible for covering of these transport facilities by brought silty materials, as a result of which normal functioning of motor transport is not available. The Khaldan-Zagatala-Balaken highway passes 44 off Oghuz city, and 16 km off Sheki and Gakh cities. Over 80% of highways of local importance are made of soil, and they suffer from flooding more.

Since the territory of Sheki-Zagatala region historically has been known as a place of intensive flooding, municipal automobile roads in villages are exposed to the influence of this natural disaster. Most of 1270 km long soil roads in this region are periodically being exposed to the influence of floods. Of this figure, 2,1% is shared with Balaken, 33,8% by Zagatala, 15% by Gakh, 38% by Sheki, 8,5% by Oghuz, and 2,7% by Gabala regions. The highways of state importance, suffering from floods and inundations include

Aghsu-Goychay, Aghsu-Ismayilli, Ismayilli-Basgal in DaghligShirvan, Ganja-Dashbulag-Khoshbulag, Shamakhi-Tovuz in Ganja-Gazakh, and Lankaran-Lerik in Lankaran-Astara region.

In the Sheki-Zagatala and Guba-Khachmaz regions, highways and automobile roads connect 70 and 60 villages respectively, and the same time are exposed to threat of flood. The number of such roads is 32 in Ganja-Gazakh, 26 in Nakhchivan, 24 in DaghligShirvan and 18 in Lankaran-Astara region. Floods are responsible for the destruction of highway-protecting dams and bridges, and disrupting of connections between settlement and the capital of Azerbaijan for a long period. Disruptions in manufacturing and service sector entail large economic losses. Therefore, it is advisable to construct new automobile roads outside valleys as well as build stable bridges, protecting installations and concrete dams in order to escape damages relevant to transport facilities.

In general, bridges must be constructed on at all river valleys that threaten highways. It is advisable also to remove all stones and other brought materials from the bottom of bridges at least once a year and to use them in construction. Moreover, in the areas of bridges, building of 150-200 m long protective dams along with banks of rivers is also required.

The following Table 1 reflects encompassment grade of floods as well as other natural disasters in various regions of Azerbaijan.

Table 1
Highways exposed to natural disaster in rural municipalities

| # | Administrative regions | Kind of natural disaster | Highways |
|---|------------------------|--------------------------|---|
| 1 | Sheki | Flood and inundation | BirinjiBilajik-IkinjiBilajik-AshagiGoynuk-AshagiLayisgi-Kondelen-Inche-Gokhmug; Baggal-IkinjiBilajik; Junud-AshagiGoynuk; BashLayisgi-AshagiGoynuk; BashGoynuk-AshagiGoynuk; Okhud-Gokhmug; AshagiLayisgi-AshagiGoynuk; Gokhmug-Gardaghli; Gokhmug-Baltali-Oryet; Junay-Babaratma-Dashuz-Kudurlu-Chalabikhan-Goybulag-Jafarabad-Boyuk Dahna; Chalabikhan-Kosali-Orta Zayzid-BashZayzid; Jafarabad-Aliyar-Aydinbulag-AshagiDashagil; Sheki-AshagiKungut; Sheki-AshagiKeldek; Sheki-Kish. |
| 2 | Zagatala | Flood and earthquake | Zagatala-Kabaloba-Chokekoba-Magov; Ashagi Tala-Ali Bayramli-Mughanli; Bahmatli-Lahij; Ashagi Tala-Bazar-Aliabad-Tasmali (Gakh); Ashagi Tala-Mukhakh; Gimir-Chobankol; Yeni Suvagil-Gulluk (Gakh). |
| 3 | Oghuz | Flood | BashDashagil-Mukhas-Bujag-Khalkhalgishlag-Armanat; Oghuz-Gumlag-Shirvanli-Tayifli; Khalkhalgishlag-Gumlag; Padar-BoyukSoyudlu-Garabulag; Filfili-Abdalli-Khachmaz-Sinjan-Terkesh-Deymedagli; Khachmazgishlag-Sinjan |
| 4 | Gabala | Flood | Gemervan-Bum-Uludashli; Uludashli-Tikanli; Bum-Khirkhatala-Zaragan-Boyuk Pirali; Mikhligovag-Nij-Jorlu-Kichik Pirali-Boyuk Pirali; Nij-Deymedagli; Nij-Zergerli; Zaragan-Kichik Pirali; Khirkhatala-Kichik Pirali; Tuntul-Yengina; Soltanukha-Boyuk Amili-Kichik Amili-Zalam; Tovleh-Hajjalili-Mamayli-Ovchulu; Dizakhli- |

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| | | | Charkhana-Kurd Savalan-Savalan-Bayli. |
| 5 | Gakh | Flood and inundation | Ilisu-Aghbash-Gakbbash; Gakh-Bilajik (Sheki); Ibachli-Kotuklu; Gakh Ingiloy-Boyuk Alatamir-Garaghan-Shikhlar-Deymedaghli-Jalayir-Gipchag-Gaysarli-Garadolag-Boyuk Dehne (Sheki); Meshebashi-Amirjan; Garamesha-BoyukAlatamir; Fistigli-Turajli-Marsan-Tasmali-Zayam; Shotavar-Almali-Jalayir |
| 6 | Balakan | Flood | Balaken-Gasbineh-Katekh; Katekh-Beterbineh-Mollachibineh-Garavelli; Garachibine-Gadashineh-Garavalli-Pushtetala-Kortala-Ititala; Kortala-Bichigarbineh; Okuzovtala; Okuzovtala-Guluzenbilih-Darvazbineh; Guluzenbilih-Mazimgarishan; Kishebulag-Saribulag; Tulu-Mazimustu; Gerekli-Chorchorbineh-Pochtbineh. |
| 7 | Ordubad | Flood and inundation | Jannab-Duylun; YukhariAylis-AshagiAylis; Dizeh-Vanand; Dasta-Khanagha; Sabirkend-BashDizeh; Bilev-Behrud; Unus-Keleki-Dirnis; Ganza-Anabad; Nusnus-YukhariChenneb-Duylun; YukhariAylis-AshagiAylis; Dizeh-Vanand; Dasta-Khanaga; Sabirkend-BashDizeh; Bilev-Behrud; Unus-Keleki-Dirnis; Ganza-Anabad; Nusnus-YukhariAndamij; Aza-Azadkend |
| 8 | Ordubad | Flood and inundation | Ordubad city-Kotam; Jamaldin-Arazin (inJulfa); Bananiyar-Goydereh; Gazanchi-Milakh; AshagiBuzgov-YukhariBuzgov (inShahbuz); Selesuz-Dayagli; Garababa-Ayrinj; Bichenek-AshagiGishlag |
| 9 | Babek | Flood | Karimbayli-Kultepe; Jahri-Gulshanabad |
| 10 | Sharur | Flood | Akhura-Hamzali; Aliabad-Chalkhangala (inKengerli); Garabaghar-Chalkhangala |
| 11 | Shabran | Flood | ChayGaragashli-CholGushchu-HajiGaragashli; CholGushchu-Sarvan; Rahimli-Padar-Aygunlu; Piramsan-Gandov; Galagah-Tezekend; DaghBiliji-Mumlu; Leyti-Gandov; Zeyva-Kilvar |
| 12 | Guba | Flood | Gimilgishlag-Alimammadoba; Hajigaib-Mirzagasim; Zardabi-Barli; Zizik-Alekheyevka; Vladimirovka-Mirzammadkand; GirmiziGasaba-Mirzammadkand; Uzunmesha-Alpan-Khujbala-Digah; Galaduz-Dagli; Uchgun-Gimil-Kusnat; Gechresh-Ispik; Yenikand-Tuler; Susay-Geray; Grizdahna-Griz-Jek-Alik-Haputlu; Khinalig-Galaykhudat; Alik-Zeyzid; Derk-Talish-Yerfi; Jimi-Garavolustu-Gonagkand; Khirt-Atuj; Khanagah-Gulezi; Firig-Afurja-Tengealti; Sebetler-Gorkhmazoba; Chichi-Sebetler; Rustov-Gamgam; Zargava-Sirt Chichi; Dehne-IkinjiNugadi; Pirvahid-Sofikend; Talishabad-Kharosha; Velvele-Isnovgishlag. |
| 13 | Gusar | Flood | Garatoba-Hachatala; Zukhuloba-Shirvanovka; Kufoba-YeniYahirjal; Samur-Gullar; Hiloba-Yasaboba; Leyergishlag-Gukhuroba; Lango-Jaghargishlag; Yeni Hayat-Galajug; YukhariZeykhur-Imamgulukend; Badirgala-Gedezeykhur; AshagiLeyer-Gedezekhur; AshagiLeyer-Gedezeykhur-Avajug-Hil; Hil-Yasab-Piral-Hazra; Hazra-Ugur-Ajakhur; Ugur-Mujug; Khulu-Gilah; Zukhul-YukhariTahirjal; Gelejug-Badirgala; Balaguser-Gusar city-Chilagir-Khurar; Avaran-Urva; Suvajal-Anig-ZindanMurug; Chagar-Chetkun; Kuzun-Laza |
| 14 | Siyazan | Flood | BoyukHamla-Siyazan; Nardaran-Dere Zarat; BoyukHemle-Siyazan; |

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| | | | Nardaran-Dere Zarat; Kunovsha-Arzikush; YukhariAlaz-YanigAlaz; Almakoglu-DaghGushchu |
| 15 | Khachmaz | Flood | Ukuroba-Zukhuloba; Tourist-Shimal; Nabran-Sahiller; Meshali-Ashagioba; Murugoba-Lajat; Pardigiran-Susaygishlag; Khuray-Mugtadir-Sabiroba; Shollar-Khudat-KohneKhudat; Bostanchi-Gusarchay-Palchigoba; Nagioba-KichikBarakhum; Yatagoba-Kharaoba; Uzunoba-Tikanlioba; Aghtala-Narajan; Godakli-Alekseyevka; Ahmadoba-Azizli; Niyazoba-Babanli; Aghchay-Ilkhichi; Garachi-Jaghatay; Chakhmagli-Gobugirag; Yerguj-Sarkarli; Hajibeyli-Arzu; AshagiZeyd-Gadimgishlag; Hulovlu-Garadagli; Galagan-Sayad-Ilkhichi; Khanligoba-Charkhi. |
| 16 | Aghsu | Flood and inundation | Nuran-Zargava; Padar-Gursulu; Padar-Bayimli-Arabsarvan; Arabmehdiyev-Gasimbayli; Akhundlu-Chiyni; Musabayli-Garagoyunlu; Pirhasanli-Elabad; Aghsucity-Garagashli; Aghsucity-Ulguj; Aghsucity-Navahi; Muradli-Tekle; Garabaghli-Bozavand-Agharkh; Aghalarbeyli-Arabushaghi; Garabaghli-Shahbayli; Duvaryan-Goydan. |
| 17 | Ismayilli | Flood and inundation | Burovdal-Chandahar; Duvaryan-Goydan; Lahij-Namazgah-Mushkemir; Gandov-Kohnedakhar; Gandov-Garagaya; Zarnava-AshagiZarnava; Basgal-Zeyva; Tirjan-Machakhi; Pireblgasim-Minge; Bilistan-Shabiyani; Goshakend-Aghbulag. |
| 18 | Gobustan | Flood and inundation | Khilmilli-Nabur; Khilmilli-Sundu; Arabshalban-Chukhanli; Jayirli-Chalov; Gurbanchi-Mereze-Narimankand; Garachuzlu-Khalafli |
| 19 | Shamakhi | Flood and inundation | Pirbayli-Gizmeydan; Archiman-Talishnuru; Ahmadli-Hajili; Malham-Chukhuryurd; Meysari-BoyukKhinisli-Shamakhicity-Sabir; Kalakhana-Adnali; Sabirli-Charhan; Chiragli-Ajidara; Malikchobanli-GoylerDag-Yenikend; Lalezar-Gushchu; Hamyali-IkinjiChayli; Gonagkend-Jabani |
| 20 | Aghstafa | Flood | Pirili-Kor Khalfali; Khilkhila-Mollajafarli; Kolayir-Duzgishlag; Poylu-Shakarli-Zalimkhan |
| 21 | Dashkesan | Flood | Chaykend-Chovdar; Bayan-Gushchu; Dastafur-Shahveledi; Ahmadli-Dardere; Mollahasanli-YukhariDashkesan; Alunitdag-Kemergaya; Khoshbulag-Zagali; Garagullar-Garataglar; Chiragli-Almali; Chanagchi-Zivlan |
| 22 | Gadabay | Flood | Garaveller-Eyridereh; Goyalli-Kollu; Shinikh-ChayRasullu; Zamanli-Arabachi; Farzali-Isali; Gasimagha-Motudara; Novoivanovka-Chobankend; Novosaratovka-Garamammadli;Yenikend-Chobankend; Atakhal-BoyukGaramurad; Garamammadli-Dikbash; Inakboghan-Gasimli; Kesemen-Keleman; Parakend-Kohnekend; Gerger-Sarikoynek; RustamAliyev-Chalburun-Plankend; Duzyurd-Yenikend; Garadag-Soyudlu; Pirbulag-Soyugbulag; Muzdurlar-Dalimammadliin Goranboy; Nizami-Khoylu-Garadagli-Shabalidi; Khoylu-Yolgulular; Samadabad-Khasadarli; Borsunlu-Gazakhar; Veyisli-Rahimli; Goranboy-Garasuleymanli; Safikurd-Tatarli; Garapirimli-Girigli-Hamanli |

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| 23 | Naftalan | Flood | Naftalan city-Gasimli; Tap-Tap Garagoyunlu; Gargujag-Shafibayli-Zeyva; Shafag-Garachinar; Gulustan-YukhariAgjakend; Buzlug-Manash; Todan-Erkej |
| 24 | Goygol | Flood | Nadil-Samadli; Jumshudlu-Hachagaya; Gizilja-Hachagaya; Yalgishlag-Yeni Gizilja; Uchtepe-Firuzabad; Topalhesenli-Ganja-Zurnabad; Dozular-Panahlar; Sarisu-Gushchu; Chaykend-Toganali-Azgilli |
| 25 | Gazakh | Flood | Gazakhcity-Khanliglar; Kosalar-Janali; Barkhudarli-Sofulu |
| 26 | Shamkir | Flood | Dallar; AshagiSeyfalli-YukhariSeyfalli; Chayli-Garagojali; Mehrli-Narimanli; Varli Hayat-Yeni Goycheh-Gunashli; DagCayir-Gunashli; Tatarli-Zayam Jirdakhan; Mukhtariyyat-Miskinli |
| 27 | Tovuz | Flood | YukhariOysuzler-Alibayli; Vahidli-Agdam; Bayramli-AsrikJirdakhan; Saritala-Dondarli; Isakend-Ashralar; Garibli-Almalitala; Almalitala-Agbashlar; Lazilar-Dallakli |
| 28 | Astara | Flood | Pensar-Lalakapashta, Binabay-Siyakash-Hasin, Astara-Rudakanar, Zungulash-Alasha, Sipiypart-Vanashikash, Palikash-Vavada |
| 29 | Lankaran | Flood | Lankaran-Veladi, Ballarbul-Luvasar, Kosalar- Bala Shuruk, Rvo-Mollakend, Siyabli-Shovu |
| 30 | Masalli | Flood | Kalinovka-Huseynhajili, Dadva-Musakuche, Dadva-Masalli, Kosakul-Allahyarli, Isi-Shikhlar |
| 31 | Yardimli | Flood | Tazakand-Golyeri |
| 32 | Shamakhi | Landslip | Sharadil-Sagiyan-Shirvan-Muganli-Gurdtapa; Malham-Dadagunesh-Chagan; Demirchi-Safali; Gizmeydan-Ahmadli; Nuydu-Charhan-Sabirli |
| 33 | Agsu | Landslip | Nuran-Nuydu-Khasidereh; Hingar-Gurjuvam; Girlar-Sangalan; Surakhani-Kalva; Dilman-Hajiiman; Khojatman-Dilman; Nuran-Kardakhan; Kandakhan-Zargava; Gurjuvan-Hingar; Gurjuvan-Kovluj-Agsu; Agsu-Muganli (Shamakhi) |
| 34 | Gobustan | Landslip | Jayirli-Sundu; Chukhanli-Sundu; Arabshahverdi-Gurbanchi; Khilmilli-Sundu-Tekle; Poladli-Ahmadli |
| 35 | Guba | Landslip | Chartepe-Orta Khuch-AshagiKhuj-AshagiAtuj; Alpan-Khujbala-Digah; Kupchal-Uchgun-Gechresh-Ispik-Mohuj; Susay-Garay-Uzunmesha-Kurkun; Khinalig-Alik-Jek-Giriz; Adur-Garkhun-Ruk; Zeyid-Budug-Yalavanj-Dagustu; Talish-Yerfi-Gayadali; Zikhir-Gurdeh; Khanagah-Shudug-Nuydun; Alij-Tuler-Digah-Armaki. |
| 36 | Gusar | Landslip | Laza-Kuzun; Chatgun-Jagar; Alikh-Guturgan-Generchay; Sudur-Gukhur; Arjan-Generchay; Duz Tahir-BoyukMurug-Ajakhur-Ugur; Guturgan-Ganarchay; Zindan Murug-Anig-Suvajal; YukhariLagir-Khuray; Urva-Chilagir-Gayakend; Urvaoba- Chabuglu-Gukhuroba-Jijanoba; Zeyva-Kilvar inShabran; Meytabli-Rahimli; Sumagava-Khalfalar; Zohrabkand-Gizilgazma; Dehne-Chukhurazami; Gariblik-Chovrurah; Pirabadil-Gorgan; Piramsan-Gandov-Leyti; Lajadi-Tezekend; Khalfalart-Surra |
| 37 | Siyazan | Landslip | KohneGushchu-Arzikush-Kunovsha-Garagoz; Garagoz-YukhariAlazi-DagGushchu; YanigAlazi-KohneGushchu; Zarat-Galashikhli- |

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| | | | Chandahar; Gallalti-Orta Chalgan; Galaalti-Mashrif; Yenikend-Gilgilchay |
| 38 | Goygol | Landslip | Ganja-Togana-Kalbajar, Ganja-Hajikand; Goranboy-Hajikand; Azgili-Toganli; Hajikand-Ashigli: Panahlar-Dozular |
| 39 | Shamkir | Landslip | DagJayir-Gunashli; Chanlibel-Seyidlar; Atabay-Chanlibel: DagJayir-Yeni Goycha-YukhariChaykand; Narimanli-Mehrili |
| 40 | Gadabay | Landslip | Garavalilar-Ayridereh, Hajilar-Turshsu, Goyalli-ChayRasullu, Novasaratovka-Garamammadli, Ayrivang-Arigiran-Gasimli, Gurudara-Toplar-Poladli, Gasimli-Gurudara, Shakarbay-Godekdereh-Sarihasanli |
| 41 | Tovuz | Landslip | BoyukGishlag-Chatakh-Shamlig, Mollalar-Gandalan-BoyukShamlig, Cheshmali-Gandalan, Guvandi-Papagchilar, AsrikJirdakhan-Agbulag-Munjuglu, Garibli-Oskan-Hatamlar, Saritala-Yogunbulag-Namkhosh, Garalar-Gonagli |
| 42 | Dashkasan | Surushma | Gushchu-Alunitdag-Gurbulag, Ahmadli-Mollahasanli-YukhariDashkasan, Khoshbulag-Zogali-YukhariDashkasan |
| 43 | Samukh | Landslip | Lak-Choban-Abdalli, Garabaglar-Ahmadbayli, Kasaman-Salahli-Garabagli |
| 44 | Goranboy | Landslip | Baligaya-YukhariAgjakand, Buzlug-Mashali, Erkaj-Rus Borisi-Buru |
| 45 | Astara | Landslip | Motalyatag-Akbarmahla, Rina-Marsaza, Mashkhan-Archivan, Kijaba-Degadi |
| 46 | Lankaran | Landslip | Havzova-İstisu, Shovu-Mollakand, Horavenj-Baliton, Gunahir-Godasa, Diryan-Gagiran |
| 47 | Lerik | Landslip | Burusulum-Leker, Aliabad-Galabin, Tangabin-Anzovlu, Rvarud-Anzovlu, Andurma-Piyakucha, Vizazamin-Janganavud, Nuravud-Kohna Orand, Shivla-Osyedereh, Molalan-Kekonu, Soroush-Shingaduran |
| 48 | Masalli | Landslip | Miyanku-Nazaroba, Hishgadara-Mishkami, Gullutepe-Kohne Alvadi |
| 49 | Yardimli | Landslip | Golyeri-Tazakand, Arus-Tahirli, Varov-Horavar, Burzunbul-Abbasabad, Yardimli-Bozayran, Ostayir-Dallakli, Khanbulag-Yeni Abdinli, Pirembel-Shafagli, Avur-Chayuzu, Urakaran-Garagaya, Pestashar-Nisagala |
| 50 | Ordubad | Landslip | Bilav-Bist-Khurs-Nurgut; Bist-Nasirvaz; Bilav-Paragachay |
| 51 | Julfa | Landslip | Saltag-Goydara; Lakatag-Arafsha-Teyvaz |
| 52 | Shahbuz | Landslip | Nursu-Kulus; Kulus-Kechili; YukhariGishlag-AshagiGishlag; Agbulag-Gomur; Bichanak-AshagiGishlag; Kuku-GizilGishlag |
| 53 | Babak | Landslip | Jahri-Gulshanabad; YukhariBuzgov-AshagiBuzgov-Garmachatag |
| 54 | Kangarli | Landslip | Khok-Givrag |
| 55 | Sharur | Landslip | YukhariYaychi-Avush |

In the territory of Azerbaijan, inundation is another influential factor which influences on the construction and use of highways.

872,5 km long highways continuously face heavy influence made by inundations in the country. 70-75% of this highways lie through the territory of Aran, Lankaran-Astara and Absheron economic regions. In particular, problem of negative influence of inundations is typical for the Aran economic region which has large transport network. 791 villages of this region are need of the construction of new bridges with

considering natural disasters. In Aran, rural settlements are situated in average 20-25 km off the center of administrative territorial units. Inundations curb and damage traffic at soil roads and also stone- and gravel-covered highways during spring, autumn and winter when amount of precipitation is higher. Soil roads between rural settlements may be exposed to relevant damage more.

Landslips also negatively affect the functioning of highways in the territory of the country. Landslip is one of main problems which may impact on not only transport facilities but also the rational territorial organization and development of other economic activities and manufacturing branches in the regions of Azerbaijan. Landslips with destructive power may be observed more in mountainous and foothill areas of the country.

The territory of DaghlighShirvan economic region is a place where landslips repeatedly occur each year. The total length of highways is 1276 km here, of which 320 km or 25,1% continuously suffer from landslips and floods. The problem is seen particularly in the valleys of the Girdmanchay, Aghsu and Pirsatchay rivers as well as the Lahij and Mudri depressive areas and the Basgal area of Govdagh and Niyaldagh mountain ranges. At the Mughanli-Ismayilli highway, landslips create great challenges for the functioning of highways since 1982. This landslip area encompasses 10 ha in the Aghsu and Shamakhi administrative regions. The mistakes made during the building of highways are shown as a reason of the emergence of landslips in this area. The consequences of relevant mistakes are seen also at some parts of the Baku-Shamakhi highway. Regretfully, the inappropriate actions when building of highways still may occur here. Landslips are characteristic for the 107-110 km parts of this highway (at 5 ha of area). Some parts of the Baku-Aghsu highway (at 132nd km, 133rd km and 147th km) are also affected by landslips. In general, 2546,5 km long highways of local importance, connecting 62 villages in DaghlighShirvan, are functioning under the risk of natural disaster.

In Guba-Khachmaz region, landslips are widespread in medium and higher parts of basins of the rivers such as Gusarchay, Gudyalchay, Valvalachay, Devechichay and Gilgilchay. In the territory of region, the 6146,5 km long highway, connecting 43 villages exist under threat of natural disaster.

Emergence of landslips is a typical problem also in Absheron region which is characterized with high urbanization. This kind of natural disaster creates serious challenges for the development and territorial organization of highways. The territories with high intensity of landslips include territories where 162,2 km long highways are crossing medium- and upper parts of basins of the rivers Pirsatchay, Sumgaitchay, Sitalchay and Atachay, and are connecting 17 villages. Ahmadli-1 and Ahmadli-2 areas, the area near the monument on the name of N. Narimanov, the Zigh highway, the areas of Shehidler Alley, and also Garachukhur, Yeni Yasamal, Masazir, Bayil and Buzovna settlements are dangerous territories in terms of occurrence of landslips. Such areas also include Ganja Avenue and N. Tusi Street in Ahmadli, the areas between Ganja Avenue and General Shikhliniski Street. Zigh-1 and Zigh-2 are the areas of landslips which encompasses from Zigh settlement to the same called highway and the local plant, and the highway areas between Zigh to Hovsan settlement respectively. Another landslip area is situated among Ahmadli and Gunashli residential areas in the territory of Surakhani district. N. Narimanov Circle 31/33 and Y. Dashli Street of Yasamal district are also characterized with the occurrence of landslips.

In Ganja-Gazakh region, 4737,6 km long highways, connecting 40 villages as well as in Lankaran-Astara region, 2644,7 km long highways, connecting 37 villages may be exposed to the influence of landslips. In Nakhchivan region, 435 km long highways of local importance, connecting 41 rural settlements continuously have faced landslips at different time.

In Sheki-Zagatala economic region, landslips are situated far off the human settlements. However, in this territory, the highways, connecting 16 settlements with regional centers and other clusters, exist under the risk of landslips.

Taking all the above-mentioned into consideration, complex forestation and reclamation works, and also measures of agroforestry, engineering and building should be managed in order to protect highways and communication network from landslips in the territory of Azerbaijan Republic.

The relevant measures of protection may be divided into two groups: passive and active works. The first group includes the prohibition of construction of water-using facilities at highways and banning all activities in the inclined territories. Deforestation and installing of permanent water pipelines should be banned as well. As for active ways of management of landslips, the creation of different types of engineering and technical installations with considering local conditions and relief peculiarities as well as existence of highways and communication network, is advisable in the territories of high risk of this natural disaster.

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