

INFLUENCE OF INUNDATIONS ON DEVELOPMENT AND TERRITORIAL ORGANIZATION OF ECONOMY IN KUR-ARAZ LOWLAND

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Abstract

Global climate change and negative impacts of anthropogenic factors on environment as well as other factors have increased frequency of emergence of inundations and flooding in the world, including the territory of Republic Azerbaijan. Consequently, these processes sharply increased amount of damage caused to the country's economy and expanded areas of destruction. The economy of Azerbaijan saw damage approximately at AZN 1,5 billion as a result of inundations during the last 10 years, 66,7% of which falls to the share of the inundation occurred in 2010 at the bed of Kura River. The carried studies show that 20% of the country's administrative regions, 6,7% of the populated areas, 20,1% of the population, 3,0% of industrial enterprises, 12,3% of agricultural facilities, and 14,2% of highways are periodically being exposed to influence of inundation. In this connection, relevant suggestions and recommendations are shown in order to reduce and in part prevent the negative influence of inundations production and territorial organization of economy in the future. Economic and socio-geographic aspects of economic damage, caused to economic entities and daily activities of the population in flooded areas, have been studied by the lower flows of Kura River and Araz River that are running through the territory of Azerbaijan. The damages, faced because of inundations are comparatively analyzed for the first time by 2003, 2006 and 2010.

Keywords: inundation, engineering, reservoir, facility, economic, damage

Inundations regularly take place in connection with number of factors that have different influence on arising of this natural disaster in Kura-Araz Lowland. Geomorphologic factor (surface structure of the area where river runs, river mouth below the ocean level, river flow over natural meanders, filling the river bed and delta with accumulated materials), hydro-meteorological factor (length of rivers, size of watershed, rainfall amount and intensity in the basin, the average monthly temperature), other natural calamities (severe winds, powerful waves in rivers, landslides, rise of level of underground water, sharp fluctuations by water level at the mouth of the Kura (pre-Caspian area), freezing, earthquakes, and etc.) as well as anthropogenic factors (problems in the management of water reservoirs, low quality of concerning protective dams, deforestation, and etc.) affect the formation of inundations.

Inundation is one of the regime phases in rivers, and is depending on the physical-geographical and climate conditions of the water basin. This natural disaster is being observed during maximum water balance of river. The schedule of chronology of water balance was determined by Kura River in order to observe the regime of maximum water balance during the high level. Maximum indicators of water balance and flood emergence were observed: by Zardab region in 1956, 1959, 1963, 1968, 1969, 1978, 1984, 1988, 2006, and 2010 years; by Saatli in 1956, 1957, 1963, 1964, 1968, 1969, 1976, 1978, 1988, 1993, 2003, 2006, and 2010;

and by Salyan in 1964, 1967, 1968, 1969, 1976, 1978, 1988, 1993, 2003, 2006, and 2010. Water balance in Kura-Salyan area made 2500 m³/sec in 2010 or 1% of the limit. Maximum level in Mingachevir water reservoir was at 83, 2 meters, which has been observed in June of the same year.

From 1900 to 1953, inundations happened almost every year in the lower parts of Kura and Araz. In 1953-2000s, the number of inundations reduced due to the construction of the Mingachevir and Shamkir water reservoirs, and also Araz Water Junction. However, inundations, observed in 2003, 2006, and 2010 had larger scale and resulted in huge economic damage. The rise of water of Kura River concurs with the rise of the level of the Caspian Sea. Thus, during rise of level of water in the Caspian Sea, 40 km² of the delta of Kura becomes submerged as usual. Consequently, the mouth of the river and delta is filled up with imported materials. Therefore, the territories of Salyan and Neftchala regions become inundated. The quality of dams, constructed earlier in order to protect the surrounding areas from inundations, has been deteriorated in 2000s, and this was responsible for the emergence of floods repeatedly.

Currently, the total length of dams makes 1681 km, of which, 1592 km is made of soil whereas 89,2 km has concrete cover. 56,8 km of concrete dams consist of stone-concrete as well as 32,5 km of concrete slabs. After the implementation of land reforms in Azerbaijan, the lands between the rivers and dams were granted to people at large scale near the river bed of Kura. The new dwellers here destroyed the soil dams and laid irrigation ditches in order to water their owned lands. Such illegal ditches and channels caused to creation of favorable condition for inundations.

Taking into consideration that 80% of the economic facilities in the researched area is situated below the ocean level, it is advisable to investigate the problem of inundation from economic and socio-geographical view in order to study the impact on development of residential areas and territorial organization of economy as well as to search ways on reducing destructive power of this natural disaster.

It should be noted that the surface structure is one of responsible factors of emergence of inundation, and resettlement of the population in Mingachevir and Shirvan cities as well as Yevlakh, Ujar, Zardab, Beylagan, Bilasuvar, Hajigabul, Imishli, Kurdamir, Saatli, Sabirabad, Salyan and Neftchala regions where the studied natural disaster regularly have been taking place. Residential areas and settlement clusters are mainly observed by the two horizontal areas: between 26,5 - 0 m and 0 - 200 m. Areas lower than 0 meter of altitude include 368 (43,4%) settlements with 789 thousand people (44%) in total, while the territories higher than 200 m of altitude include 478 (56,3%) settlements, total population number of which is 1 million people (55,6 %).

Table 1

The main indicators of settlements exposed to inundation in Aran economic region

#	Names of administrative regions	The total number of settlements	The number of settlements, affected by inundation	%
1	Sabirabad	75	36	48
2	Hajigabul	31	14	45
3	Imishli	51	31	61
4	Kurdamir	62	33	53
5	Neftchala	52	44	85
6	Salyan	51	46	90
7	Zardab	42	31	74

8	Yevlakh	50	1	2
9	Barda	111	–	0
10	Bilasuvär	26	14	54
11	Goychay	56	–	0
12	Saatli	44	30	68
13	Aghjabedi	46	–	0
14	Aghdash	75	–	0
15	Beylagan	42	10	24
16	Ujar	30	8	27

The population and also industrial facilities of the existing residential areas are under the risk of natural calamity and potentially may be exposed to flooding. Especially territories of Imishly, Saatli, Hajigabul, Sabirabad, Salyan, Zardab and Neftchala administrative districts and Shirvan city (which are below the sea level) regularly suffers from flooding. Depending on natural and economic conditions, inundations may damage the above-mentioned areas at different grades. In the meantime, urbanization level and population density is different by the regions, and these factors may define heaviness of destructions. Statistical analysis of the data shows that the number of population in the administrative regions, located at lower parts of flow of Kura and Araz, has been increased in recent years. The newly-settled territories have been expanded compared to previous years.

Industrial facilities have been exposed to inundations at relatively less extent compared to other economic areas. At the same time, damage caused by the inundations to industrial facilities has indirect feature. Inundations destroy infrastructure facilities, particularly highways. As a result, people may be late for workplace, while industrial facilities are not provided with the necessary raw materials in time. Industrial enterprises, not working at full capacity are not able to deliver their products to the consumers in time as well.

Currently, oil- and gas production facilities in Salyan, Neftchala, Shirvan city as well as the power stations in Mingachevir and Shirvan operate under the threat of flooding. Mingachevir and Varvara Hydroelectric Power Stations are also exposed to the influence of inundations.

There are 7 oil- and gas fields in Kura-Araz Lowland. More than 60 oil- and gas producing facilities are operating as well. Enterprises of Shirvan, Salyan and Neftchala regions have seen economic loss at AZN 12 thousand in 2003, AZN 36 thousand in 2006, and AZN 67 thousand in 2010.

The carried studies show that 4% of light industry and 12% of food industry in Kura-Araz Lowland are either directly or indirectly being suffered from inundations. The sturgeon-breeding enterprise in Neftchala and fish- and caviar cannery in Banka settlement faces losses at over AZN 100 thousand. Moreover, 10 tons of grain and flour products became completely unfit for consumption in the mills and elevators. Consequently, 15-20% of the domestic demand for flour was provided due to import from foreign countries. 1419,5 thousand hectares or 29,8% of the overall 4756,5 thousand hectares arable lands are also targeted by the risk of inundation. Major problems emerge in meeting population's demand for food products as a result of soil salinization and deterioration in the quality of lands in low streams of Kura and Araz Rivers. Taking into consideration that Azerbaijan imports about 1 million wheat or flour products per year from foreign countries, reclamation of salinized areas, wetlands and eroded lands should be considered as one of more important issues for the country in terms of food security of the population and reducing dependence on foreign import.

86,3% of cotton, 72% of fodder crops, 70% of vegetable garden plants, 52% of sugar, 40% of wheat, 27% of fruit, 26% of vegetables, 19% of grapes, and 11% of potatoes produced in Azerbaijan fall to the share of

Kur-Araz Lowland. The amount of damage, caused to planted areas in Aran economic region by inundations in 2003 and 2010 was determined. The studies showed that in 2010 12,4 thousand hectares, destined for cotton-planting out of the overall 31,3 thousand hectares was flooded. Decrease in cotton-planting fields is partially related to inundations in recent years. Repetition of natural calamities in Aran economic area may lead to complete extinction of this traditional agricultural area in the future. In the meantime, livestock farming is impacted by inundation. In 2010, inundation in the region was responsible for killing of 42 thousand cattle and being useless of 2320 hectares of pasture territories.

More than 80% of existing irrigation systems in the country is located in Kura-Araz Lowland. Water Melioration OSC, the Ministry of Emergency Situations and the Ministry of Agriculture should pay more attention to the protection of water channels, irrigation channels, water distributing locks, collectors, drain pipes and etc. from inundations.

Transport facilities also periodically see damage because of different natural disasters, including inundations. In 2003, 2006 and 2010, inundations seriously damaged 366 km long highways of state importance, 305 km long highways of regional importance, and 2317,5 km long soil roads in the researched area.

Baku-Tbilisi-Aghstafa railway line runs to the west, while Baku-Shirvan-Astara railway runs to the south through the researched area along with highways of international importance. Inundations in the recent years have seriously damaged the transportation system, especially highways and railways. In this regard, inundations emerged in 2010 may be mentioned in particular. Moreover, 225 km long part or 23% of all water pipelines became disabled as a result of inundation.

Administrative buildings and cultural objects also may be exposed to the influence of inundations. In this connection, it is notable that 22 out of 1041 libraries, 12 out of 665 cultural clubs, and 6 out of 31 museums are located in the territories of high risk.

The two State Programs on "Socio-economic development of the regions" (2004-2008 and 2009-2013 years) included separate preventive measures concerning negative influence of inundations. The State Programs have specified the issues on reducing negative impact of various natural calamities, consequences of floods in the regions as well as solutions for elimination of damage. AZN 300 million was allocated from the state budget under the decision of the Parliament in order to eliminate the relevant damage (2010). The Action Plan on the preventive measures, consisting of 19 items is to be implemented.

However, in order to reduce devastating power of inundations in the country, special State Program should be adopted, and the cadastral map of flood-prone areas should be prepared in the future.

In order to reduce damage, caused by inundations in Azerbaijan, the following engineering and non-engineering methods of prevention are considered as necessary:

I. Engineering methods:

1. Construction of water reservoirs; Relevant regulation- and management works to be done with joint efforts by the neighboring countries, territories of which share water basin of Kura and Araz.
2. Restoration of previous dams, and construction of new ones;
3. Creation of meanders;
4. Management of silt-cleaning works at river's mouths and deltas;
5. Restoration of standing lakes and benefit their existence;
6. Management of river valleys;
7. Supply of concrete cover for all water-providing systems;
8. Balancing of level of underground water.

II. Non-engineering methods:

1. Forestations;
2. Establishing the flood forecasting system;
3. Increasing the efficiency of social insurance;
4. Management of immigration of population in the relevant territories.

Moreover, the measures, implementation of which seems urgent and of practical importance are:

- Construction of new branches in the delta of Kura River; restoring the ancient arm of Araz River (140 km long) near Bahramtapa Water Junction in Imishli region;
- Creation of more than 50 meanders at Kura River from Mingachevir Water Reservoir to the Caspian Sea;
- Construction of protection dams, reinforced with concrete cover around the strategically important facilities in the flooded areas;
- Restoration of SarisuLake, AghGolLake and other lakes on the banks of Kura and Araz for enfeebling inundations;
- Discharging water of Sarisu Lake into Main Mil-Mughan Collector;
- Taking preventive measures for possible erosion processes.

Among important measures, restoration regulatory role of the lakes, situated on the banks of Kura River is particularly mentionable. In the meantime, an accurate inventory on all economic areas of the flood-prone territories should be managed. Special laws should be adopted for protection of preventive dams as well. The quantitative indicators reflecting economic damage should be accounted by the relevant state agencies. Insurance by inundations should be paid taking into consideration of interests of dwellers and must serve for enhancing their living.

Creation of new small arms in the delta of Kura River may facilitate the flow of water into the Caspian Sea. This also may play a positive role for fishing in the Azerbaijani sector of the Caspian Sea. Taking into consideration high level of groundwater in Neftchala and Salyan, the construction of new drainage collector seems rational, too.

So, inundations, occurred in 2010, proved the importance of restoring the previous ditches and channels, protective dams, drainage-collector systems, and using the region only with winter pasture purposes. The development of special plan on preventing inundations should become a matter of state importance.

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