

Change in long-term climate characteristics and flow rates of the upper Naryn river in vegetation period. (Effect of climate changes on the upper Naryn river flow in vegetation period).

Vegetation period is a period from April to September and is considered to be an important river regime parameter for water management and use in hydropower and water industries. The river Naryn is a main water and hydropower artery in Kyrgyzstan and neighbor countries (Uzbekistan and Kazakhstan). In the coming years it is expected to construct cascade hydropower stations on the upper river Naryn, taking into account that the study of the upper river regime, including observation data for the recent years as well, is becoming particularly important and actual issue.

This work presents the study of hydrological and climate change characteristics of the vegetation upper Naryn river flow for the observation period from 1931 to 2012; including hydrological regime characteristics of the upper river Naryn – according to data obtained from the hydropost “River Naryn – Town Naryn” (HPNN), climate characteristics – according to data obtained from the meteorostation “Tien-Shan” (height 3614 m.), located in glacial nival zone and “Naryn” (height 2040 m.), located in the downstream of study catchment area.

Starting from the year 1992, according to data of the hydropost “River Naryn – Town Naryn”, river discharge increase has been observed in the upper flow of the Naryn river. For the vegetation period from 1931 to 2012 it constituted 177 m³/sec. or 122% of the rates for the period 1931-1991 that were 145m³/sec. Having a glacial-snow derived nourishment the river (with a maximal high water rate in July- August) rate in July, which is the month of glacial nourishment, has been observed to decrease from 1992 to 2012 nearly by 10%.

The high water peak gradually shifts to May-June, when the seasonal snow melting nourishment (April, May, June) increases. Decrease of river flow rates in July starting from 1992 is connected with a glacial degradation and firn line retreat.

The most significant role of streamflow formation in HPNN in vegetation period is total sum of precipitations in cold period (October-March) that form snow resources that have been increasing by 40 mm (according to Tien-Shan meteorostation data) and by 30 mm (according to meteorostation Naryn) since 1992 to 2012.

The sum of plus air temperature influencing a snowmelt intensity has increased for the period of observation according to the station Tien-Shan from 349 to 482°C, and according to the station Naryn – from 2531 to 2869°C. The quantity of days with plus air temperature has also increased for the period of observations according to the station Tien-Shan from 109 to 122 days, and according to the station Naryn from 220 to 236 days. The dates of transition of plus temperatures through 0°C have been moved for the recent 10-15 years to earlier dates: in Tien-Shan meteorostation it is observed to be shifted from the middle of May – June to April-May, in the Naryn station from April- second half of March to the first half of March.

The nearest correlation dependence of air temperatures and HPNN flow rates for vegetation period was obtained by temperature values from the meteorostation Tien-Shan for summer period, which have increased for multiyear observation period by 1,2°C.

The described changes in general climate parameters resulted in increase of the upper flow of the Naryn river for the vegetation period from 1992 to 2012. The river discharge rates in low-water season (October-March) have increased in accordance with the river flow in vegetation period. From 1992 to 2012 they constituted 37,6 m³/sec or 126% from the values for the period 1931-1991 (29,9 m³/sec).