

Preliminary Study and Assessment of Drinking Water from Almaty, Kazakhstan

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Article info

Received:
5 April 2022

Received in revised form:
24 May 2022

Accepted:
2 July 2022

Keywords:

Drinking water
Quality indicators
Chemical analysis

Abstract

Drinking water samples from eight districts of Almaty, Kazakhstan was collected and physical and chemical analysis of the samples was carried out. Quality indicators of drinking water, such as organoleptic characteristics of water (smell, taste, color, and turbidity), general characteristics (pH, total hardness, permanganate demand, and dry residue), inorganic substances (cations and anions) and contaminants (heavy metals and total petroleum hydrocarbons) were determined, except pesticide residues which will be analyzed for further analysis with a wide range of pollutants. According to all indicators obtained for all districts of Almaty, the anthropogenic impact on drinking water in Almaty districts is assessed as low, not exceeding the permissible maximum allowable concentrations (MAC) values, and drinking water in Almaty corresponds to the approved standards and rules for drinking water of Kazakhstan. Despite of the fact that studied pollutants are below their MAC values, they still pose threat to public health due to their accumulative properties. The study of drinking water in the districts of Almaty made it possible to assess the ecological state in the studied districts of Almaty, as well as to propose recommendations for improving the quality of drinking water in areas where water quality indicators are closer to their MAC values.

1. Introduction

Kazakhstan has large reserves of natural resources. However, water resources are limited [1]. The freshwater reserves are estimated at 524 km³, including 80 km³ in glaciers, 190 km³ in lakes, and 101 km³ in river resources. Groundwater reserves are 7.6 km³ [2]. On average per capita, there is not an acute shortage of water resources. Despite the absence of a shortage, the irrational use and uneven distribution of water resources in Kazakhstan significantly complicate the solution of the tasks of providing the population of the country with high-quality drinking water in the required volume, which has not yet been fully resolved in

many settlements [3]. Kazakhstan took 54th place out of 179 in the ranking of countries in terms of drinking water quality. The drinking water quality index was 55.8 (out of 100). Drinking water was measured using the number of age-standardized disability-adjusted life-years lost per 100.000 persons (DALY rate) due to exposure to unsafe drinking water. A score of 100 indicates a country has among the lowest DALY rates in the world (\leq 5th percentile), while a score of 0 indicates a country is among the highest (\geq 95th percentile). Calculate indicator data come from the Institute for Health Metrics & Evaluation's (IHME) Global Burden of Disease (GBD) study [4].

Almaty is the former capital and the largest city of Kazakhstan, with a population of more than 2 million. Drinking water for the city of Almaty comes from several sources of water supply.

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