TO:
THE SCIENTIFIC JURY
RE:
Resolution RD-38-40/22.1.2024
of the Rector of Sofia University "St. Kliment Ohridski"

OPINION
by
Prof. Nina Nikolova, PhD
Department of Climatology, Hydrology and Geomorphology
Sofia University "St. Kliment Ohridski"

on a dissertation thesis for obtaining a PhD
professional field 4.4. Earth Sciences (Terrestrial Hydrology and Water Resources)

Author of thesis: Kalin Krastev Seymenov
PhD student in the Department of Climatology, Hydrology and Geomorphology
Faculty of Geology and Geography, Sofia University "St. Kliment Ohridski"

Thesis topic: Assessment of River Flow and Water Resources in the Catchments West of the Ogosta River

The opinion follows the requirements of the Law on the Development of the Academic Staff in the Republic of and the Regulations for its implementation, and the Regulations for the Terms and Conditions for Acquiring Scientific Degrees and Holding Academic Positions at SU "St. Kliment Ohridski", Adopted by decision of the Academic Council on 31.10.2018, last change from 28.06.2023. The opinion was prepared based on an Order of the Rector of Sofia University "St. Kliment Ohridski" № РД -38-40/22.1.2024 and a decision of the meeting of the scientific jury of 31.01.2024.

Kalin Seymenov has fulfilled the minimum national requirements for obtaining PhD degree and submitted all the necessary documents for the dissertation defence procedure.

1. **Relevance of the topic and justification of the need for the research. Accuracy of the formulated object, subject, goals, and objectives of the study**

The topicality of the research work is presented in the introduction of the dissertation and is determined by the challenges facing the scientific community and society concerning climate change and its impact on the quantitative and qualitative characteristics of river runoff and water resources. The need for the study is also necessitated by the fact that the analyzed territory (Northwestern Bulgaria) is the economically least developed part of Bulgaria, but also among the least studied regions of Bulgaria in various areas, including in the field of hydrological research.

The object and subject of the research are formulated correctly, following the topic of the dissertation. The goal is clearly defined and specified through four tasks. Despite the

limitations of the research mentioned in the introduction (e.g. the lack of publicly available information on daily water quantities after 1983), by fulfilling the set tasks, valuable information about the current state of the river runoff and water resources in the watersheds west of the Ogosta River has been presented. The research has theoretical and scientific-applied significance.

1. **Theoretical background. Research approach and research methods.**

The theoretical background of the research includes the analysis of methods (experimental and mathematical-statistical) for quality control of initial information and quantitative assessment of river runoff and water resources and qualitative assessment of water. Special attention is paid to research the intra-annual fluctuations of the river runoff. The most important legislative documents related to water are indicated (e.g. Directive 2000/60/EU of the European Parliament and of the Council of October 23, 2000; Ordinance No. H-4/14.09.2012). Analytical approaches for water quality assessment have also been analysed.

Kalin Seymenov applies a complex research approach to achieve the purpose of the study. The text in the Introduction and Chapter 1 of the dissertation, as well as the literature reference for the sources used, show that the doctoral student is well acquainted with scientific research in Bulgaria and in other countries on the topic of the dissertation, which is also proven by the correctly chosen methods in connection with the available data and the specific features of the studied territory.

2. **Analysis and interpretation of the results. Correctness and validity of the results**

The research carried out for this dissertation is based on a significant amount of quantitative information - daily and monthly values of water quantities measured at eight hydrometric stations (daily data for a period of 31 to 44 years, with the last year being 2005 and monthly data for 57 to 77 years, with the last year being 2020). Water quality was analyzed by physico-chemical indicators for the period 2015–2020 with a frequency of measurements four times a year. Precipitation data for the period 1961-2020, from two sources - Climate Reference (1990) and modified data for 1986-2020 provided by the NIMH, were also used. The study made a thorough analysis of the homogeneity of the river runoff data series, but it was not clear whether such an analysis was valid for the precipitation data series, given the different sources of information and the fact that for the last decades “modified data”. It is recommended to use the same periods when analyzing data from different points, but I accept the chosen approach, which provides as much information as possible.

In Chapter 3 of the dissertation, the natural and anthropogenic factors that form the amount of river runoff in the watersheds west of the Ogosta River are analyzed. It is noteworthy that the climatic factors and specifically the air temperature were analyzed using data from the Climatic Reference, incorrectly cited from 1990 – the temperature data is published in the 3rd volume of the Climatic Reference (1983). The author has made great efforts and has updated a significant part of the research information to cover more recent periods, but I would like to note that when the question is raised about the analysis of processes in the conditions of climate change, the information should be up-to-date and to refer to recent periods. This is also the case with information on anthropogenic factors, where sources from the 1980s are cited. Despite this note, a significant amount of new information is also found, so in general, the analyzes performed are representative of the purposes of the dissertation. The created maps, which present the spatial distribution of factors for the formation of the river runoff, also make an impression.

Chapter 4 is the essence of the scientific research and represents an in-depth analysis of the statistical structure and multi-year dynamics (monthly, seasonal, high water, low water) of the river runoff and water resources in the studied area. A component and complex analysis of the quality of river waters was carried out. The analyses are based on accurate facts and correct interpretation, and because of the well-chosen and applied methods, results have been obtained that can contribute to better planning and sustainable use of water in Northwestern Bulgaria. The results are illustrated with very well-made figures and tables, which facilitate the understanding of the study not only by specialists in the field but also by other stakeholders and users of the study.

3. Scientific contributions

In the abstract of the dissertation, doctoral student Kalin Seymenov grouped the contributions into three categories: scientific, scientific-applied, and scientific-methodological. I accept the contributions formulated in this way with the addition that the scientific contributions include not only the established trends in the change of the river runoff and the quality of the river waters but also clarification of the influence of natural and anthropogenic factors on these changes.

The dissertation represents a complex scientific study, which is relevant not only for researchers in the field of hydrology but also for a wide range of users and stakeholders involved in the preparation of plans and programs for the development of the area or in making decisions about sustainable water use.

4. Basic concepts, scientific style, and structure of the dissertation

The dissertation is written in a highly scientific style, with all concepts and definitions given precisely and clearly. All requirements regarding the structure of the dissertation have been met. Detailed information supporting the research and results is given in the appendices.

Despite the wide scope of the dissertation, the well-structured abstract provides the main results and shows Kalin Seymenov's ability to synthesize and emphasize the main points of the research.

Conclusion: The presented dissertation is an original and complex scientific study regarding the multi-year changes in the characteristics of the river runoff (seasonal and annual parameters and extreme phenomena) and water quality in a poorly studied area. The results show that the set tasks have been solved and the aim of the dissertation has been achieved. The doctoral student knows the problem in depth and has the necessary knowledge and skills for independent scientific work. A significant volume of information has been processed and analyzed, which is also important for updating and supplementing existing knowledge.

Based on the merits of the presented work – the topicality of the problem, the correct presentation and interpretation of the information, the performed calculations and analyses, the conclusions, and the significance of the results, I give a positive assessment of the doctoral student's work and propose the respected scientific jury to vote for awarding the degree of PhD in professional field 4.4. Earth Sciences (Terrestrial Hydrology and Water Resources) to Kalin Seimenov.

08.04.2024 г. Signature:.....

prof. Nina Nikolova, PhD