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Editorial

Rivers in the Focus of Natural-Anthropogenic Situations at Catchments

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Although surface water is the most accessible type of water resource for industrial and agricultural use, it is the most vulnerable to depletion in quantity and quality. As an arena for interrelation of natural and economic conditions, the River Basin needs environment protection and it serves as a facility to manage this complex natural, economic and demographic system. The basin approach proves to be effective in land use planning for sustainable natural resource management, since the operational unit for planning and management of natural resources is a catchment, which is arranged in a semi-enclosed way with clearly defined boundaries.

Rivers basins and catchments are spatio-temporal structures of geographical space in which water masses, suspended load and bed load are system-forming flows. The investigation of the river basins is interdisciplinary, and this approach will obviously be the most productive. Interdisciplinary approaches and their practical implementation in a variety of landscape and social economic conditions were identified as priorities for the Special Issue "Geography and Geoecology of Rivers and River Basins". Thus, it was assumed that the research results forming this Special Issue would focus on spatial and functional aspects of the basin organization of the landscape in various climatic and socio-economic conditions.

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Given the announced starting priorities and editorial policy of the journal of *Geosciences* (ISSN 2076-3263) and its section "Hydrogeology", an invitation for publication in the Special Issue "Geography and Geoecology of Rivers and River Basins" that I launched in August 2019 aimed to collect articles on topical issues of the topic stated in the title, including:

- GIS and remote sensing as tools for designing, monitoring, and managing basin geosystems,
- formation of an ecological framework and geodemographic and economic geoplanning within river basins,
- hydroecological monitoring of river basins and river flow,
- protection zones of rivers and water bodies: spatial planning, construction, ensuring functionality, and involving local communities in protection,
- new approaches to soil and water conservation of basins, including transboundary agreements.

The Special Issue "Geography and Geoecology of Rivers and River Basins" presents a collection of scientific contributions that provide significant research results on the interaction of diverse processes in the catchment area with rivers. Papers published in this Special Issue provide novel research results demonstrating the functioning of river basins at different scale levels, as well as in different climatic and landscape conditions.

The list of keywords chosen by the authors of their papers (AUTHKEY) was used to obtain the values of the Prominence indicator of both the degree of work intensity and the interest of the world scientific community in the selected topics using SciVal (Table 1). Using the search capabilities of Scopus in the "Related Documents" block, the number of documents that have common keywords (INDEXTERMS) was determined for each article

(Table 1). For comparison, results are shown for the number of Related Documents that were obtained by searching from Scilit (https://www.scilit.net/articles/search).

Table 1. Analytical characteristics of prominence and scientific context for keywords assigned to the document by the author, in the 5 open access papers composing the Special Issue "Geography and Geoecology of Rivers and River Basins" of *Geosciences*. Access links to each paper are provided via unique DOI numbers. Research papers are sorted in ascending order according to their publication date.

Paper Reference & DOI with Access Link	Keywords (AUTHKEY)	Percentile of Prominence	Related Documents	
		SciVal	Scopus	Scilit
Al-Madhhachi et al. [1] 10.3390/geosciences10040120	Ilisu Dam; Mosul Dam; hydrological impact; GIS; Tigris River; watersheds	95.906	276,424	172,163
Yurova and Shirokova [2] 10.3390/geosciences10040121	rivers and their basins; geochemical migration; watershed ecology; anthropogenic loads; environmental safety	95.194	6482	16,370
Mukharamova et al. [3] 10.3390/geosciences10040139	anthropogenic pressure; Volga Federal District; geoecological state; basin geosystems	69.009	4143	3822
Yermolayev et al. [4] 10.3390/geosciences10050167	erosion; satellite imagery; GIS; ephemeral gully erosion; dynamics; erosion belts	97.790	2,590,927	3,715,081
Bazhenova et al. [5] 10.3390/geosciences10050176	river basins; soil erosion; gullies; channel processes; mudflows; Eastern Siberia	69.009	102,453	90,583

Authors from the "All Submission" block represent countries such as China, Ghana, Iraq and Russian Federation. Naturally, this topic aroused interest among Russian researchers. The territory of Russia in total includes about 2.5 million rivers and streams, of which 57 have a length of more than 1000 km and about 50 rivers with a catchment area that exceeds 100,000 km^2. The average long-term water reserves in Lake Baikal are 23,000 km^3 [6], which is about 19% of the world's fresh lake water reserves.

Based on the basin's natural regularities, the basin concept of nature resource management makes it possible to establish effective spatial forms of interaction between nature management subjects. A special status is given to transboundary rivers that interlink the interests of the border states. The issues relating to the use of the basin approach in state-to-state relations on transboundary rivers were identified as one of the priorities for this Special Issue. The actual and at the same time long-standing problem of the water deficit which is increasing with every passing year, judging by some forecasts, may reach the stage of the revival of "water wars" [7]. On transboundary rivers, especially in case of using their water resources for drinking water supply, it is advisable to simultaneously develop and implement basin nature management within the framework of scientific and technological cooperation. For this purpose, it is reasonable to use such an instrument as basin agreements.

Using historical flow data analysis developed by regression models and simulation results with "Arc Hydro Tools" within GIS-techniques, Al-Madhhachi et al. [1] were rated the worst-case scenario inflow to the Mosul Dam in Iraq. The specific situation characterizing the redistribution of water resources and an assessment of the hydrological impact (forecast scenarios) of the Ilisu Dam in Turkey on the Mosul Dam is a prime example of how water scarcity problems are more challenging in arid and semi-arid countries. Thus, it is emphasized again that there is an urgent need in transboundary cooperation to address water supply problems, as well as in the development basin-wide water resources management plans.

The authors of four papers presented by Russian researchers used different-scale levels of the basin organization of the territory when choosing their study area. Accordingly, river basin problems have been characterized at levels such as a group of four large river basins of Eastern Siberia [5], parts of two large river basins within the Volga Federal District with detail down to the level of small rivers [3], 70 key areas in three river basins located in three natural zones of the East European Plain [4], and small and medium rivers [2].

At the junction of individual links of erosion-channel systems within the river basin, the sediment flows and pollutants transported with them are redistributed. This is one of the important geoecology problems, which considers the 'nature-population-economy' triad interrelations at three hierarchy levels: global, regional, and topological (on a different, landscape level, like Landscape Ecology).

Data on the modern renewable water resources of the world's rivers, which were obtained according to the assessment of the State Hydrological Institute (Saint Petersburg), show that within the European continent, the European part of Russia has the greatest river water resources (913 km yr^{-1}).

However, 84% of surface waters are concentrated east of the Urals, that is, in the Asian part of the country (77% of the country's territory). This is due to the fact that the most full-flowing rivers (in terms of average annual runoff), as shown by the Ministry of Natural Resources and Environment of the Russian Federation [6], are located in Asian Russia: Yenisei (635 km^3), Lena (537 km^3), Ob' (405 km^3), Amur (378 km^3), except for the Volga (238 km^3).

At the same time, the degree of scientific knowledge of these two parts of Eurasia differs for obvious reasons. So, in 2015 to 2016, Geographic Information System (GIS) and Geoportal with open access River basins of the European Russia [8] have already been introduced. The base layer of the GIS project is "Basins", it contains 53,865 polygonal objects in the form of cartographic models of small river basins and inter-inflow spaces. Basin boundaries were identified based on the GMTED2010 digital elevation model (Global Multi-resolution Terrain Elevation Data 2010, https://lta.cr.usgs.gov/GMTED2010), using the author's methodology [9]. Spatial detail of geodata corresponds to a cartographic scale of 1:1,000,000.

Modern advances in GIS techniques and the availability of high-resolution and ultra-high-resolution satellite images make it possible in the paper by Yermolayev et al. [4] to study an interesting phenomenon associated with the development of stream erosion on arable lands over a period characterized by the greatest changes in the climate system and economic conditions in the post-Soviet period (1980s–2010s). A trans-zonal approach to the organization of 70 key areas in three river basins, located in three natural zones of the East European Plain (mixed and broad-leaved forests, forest-steppe, and steppe landscapes). Ephemeral gully erosion assessment on arable slopes of basins using GIS-mapping, as well as detection of the erosion belt after melt flow using multi-temporal satellite images showed a sharp increase in the horizontal dissection by 4.6 times and an increase in density of the ephemeral gully network by 10 times over the past 30 years in the meridional (trans-zonal) direction.

The largest rivers in Russia such as the Lena, Yenisei and Angara originate in the south of Eastern Siberia, where the world's largest reserves of fresh water are concentrated, the main reservoir of which is the Lake Baikal. For the organization of environmentally oriented nature management, it is necessary to use our knowledge on functioning regularities in geosystems. It is particularly problematic to deal with erosion and channel systems that can provide quick and sensitive response to any changes in climate and economic activities [10]. Periodically, fluvial processes can become extreme [11], when huge material volumes are moved as a result of floods and mud flows.

The key issues of the functioning of erosion-channel systems of the river basins of Siberia were presented in the paper by Bazhenova et al. [5], which, along with Cover Story, was announced on the cover of *Geosciences* Vol. 10, Iss. 5 May 2020. These authors studied the river basins (Angara, Selenga, Upper Lena, and Upper Amur, which stretch from west to east for almost 15,000 km) as the priority entities for understanding the functioning of lithodynamical systems as the river basins are distinguished by a high sensitivity and fast response to climate change. This paper is a good example of multicomponent exploratory analysis, as attention is drawn to the main mechanisms of the functioning of systems, including soil erosion on sloping watersheds, gully erosion, channel deformations, debris flows, and catastrophic floods. An important conclusion was obtained about a reduction in the flow of pollutants into Lake Baikal since the 1990s due to an improvement in the ecological situation in the basins, in turn due to a decrease in the intensity of erosion processes against the background of conservation of agricultural land.

Small rivers belong to the most numerous class of permanent water flows with their hydrological and ecological conditions being essentially subject to the local conditions of flow formation. For example, the Ministry of Natural Resources and Environment of the Russian Federation estimates that the share of watercourses up to 10 km long is 91.4% of the total length of the national river network. Since small rivers are a combination of two elements that are interrelated in cascade: the catchment area, where the main part of the flow is formed, and the actual channel, where it is concentrated, a territorial and aquatic network of rivers is a special structural unit of the landscape shell [12]. Small rivers are particularly sensitive to anthropogenic impacts and serve as an integral indicator of complicated natural and anthropogenic processes occurring in their catchments. Therefore, small rivers trigger hydrographic network degradation.

Mukharamova et al. [3] study the geoecological state of the basin geosystems of the Volga Federal District, including 68,787 basins with an average area about 15 km^2 using an integrative approach to evaluating the anthropogenic pressure on the basin. Using the integral indicator of anthropogenic transformation of the catchment area, which was ranked to six categories of anthropogenic pressure, the authors performed mapping and zoning according to the anthropogenic pressure on each river basin. Results at this level of detail and generalized to basins are obtained for Russia for the first time.

Paper by Yurova and Shirokova [2] presents a multi-mission study of a geoecological problems of the human-induced impact on the river basin of one of the middle rivers in the basin of the Oka River (tributary of the Volga River). The results of ecological monitoring of the surface water quality of the river basin were based on indicators such as the radiation, chemical, sanitary, epidemiological, and physical–ecological risk factors. Developed by the authors, a set of measures to solve environmental problems in the river basin was based on the forecast of possible changes in the environment under the influence of the human-induced load, and programs for the rehabilitation and protection of small and medium rivers.

The total volume of soil eroded on arable lands during the period of plowing (between 110 and 230 years), in the main agricultural belt of European Russia and Siberia, to 33.4 billion m^3 [13]. Although an integrated solution to soil and water conservation problems in the basin principles has been currently scientifically justified, the development of the projects of the basin nature management and the experience of implementing anti-erosion measures at the level of large regions of the country [14,15] are not yet widespread enough.

The editorial policy was aimed at ensuring that accepted manuscripts were secured a median time from submission to publication [16]. Each manuscript was assessed via rigorous peer-reviewing from two or more anonymous and esteemed experts in the respective field.

The authors of five articles in this Special Issue have summarized 204 publications in their bibliographic lists. These articles, along with a list of related documents that were identified by the search capabilities of the Scopus database, largely show the multidimensional development of the problem of studying and managing river basins.

A set of 20 non-repeating keywords assigned by paper by the author (AUTHKEY), excluding geographic names (Table 1), showed 3,844,520 related documents in search from Scilit. A set of 16 non-repetitive controlled core topics assigned in the Scopus search engine (INDEXTERMS) showed that 255,549 related documents were identified in Scilit for five documents. However, judging by the data in Table 1, the greatest publication activity is currently associated with the use of new technologies for obtaining data in the subject area, as shown, for example, in the paper by Yermolayev et al. [4]. In particular, only four keywords (soil erosion; watershed; satellite imagery; GIS) in the search from Scilit defines 201,191 related documents.

Since the articles in their final form were published from March to May 2020, they have not yet had time to receive a significant number of citations (so far only 5 (Scopus), 5 (Web of Science Core Collection) and 8 (Google Scholar)) and reflection in the networks. In addition to citations, Altmetrics provides a variety of usage (mentions) of scientific articles. In particular, Plum Analytics, which collects online "footprints" (Usage, Captures, Mentions, Social Media) and categorizes the parameters of individual contribution to the array of studies, showed the presence, in our case, of the PlumX Metrics such as interest from readers (Mendeley) and Social Media (Facebook, Twitter).

Based on MDPI's article metrics powered by TrendMD, since the publication of the first paper in 27 March 2020 and as of the beginning of 2021 the Special Issue received more than 3900 Full-Text Views and more than 3100 Abstract Views totally, and now the ratio Full-Text/Abstract Views is 1.29 on average.

Readers, who are interested in the experience of studying the structure and functioning of river systems, solving the problems of rational and soil-water protection arrangement of the catchment area, and responsible attitude to surface and underground water resources and who wish to share their results, can in addition to this Special Issue, refer to papers published in other recent Special Issues of *Geosciences*. Different aspects of this problem have been described in the Special Issues previously initiated by the Journal's Editorial Board, mainly in the Section "Hydrogeology". So, in 2017–2018 the Special Issues were implemented: "Hydrological Hazard: Analysis and Prevention" [17], "Groundwater Pollution" [18], and also "Water Resources Management: Innovation and Challenges in a Changing World" in the journal Water (Switzerland) [19]. In 2019 to 2020, a new Special Issues: "Erosion and Sediment Source Tracing in River Catchment Systems" and "Soil Hydrology and Erosion" was added to them.

The Special Issues to be formulated by the beginning of the second half of 2021 can provide new results in the development of the multidimensional problem of river catchment systems functioning in a variety of natural and economic conditions: "Recent Advances on Sediment Transport and River Morphodynamics", "Hydraulics and Environmental Fluid Mechanics" and "The Study and Monitoring of Geomorphic Processes in Geosciences and Engineering" [20–22].

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