Journal of Geography, Regional Planning and Development
Homepage : https://journal.antispublisher.id/index.php/JGRPD
Email : admin@antispublisher.com

e-ISSN : 3032-131X
JGRPD, Vol. 2, No. 8, August 2025
Page 9-14

Issues of Delimitation and Mapping of The Sangzor River Basin Based on A Basin Approach

Qosimov Nurmuxamad Dursinovich
Jizzakh State Pedagogical University, Uzbekistan

DOI : https://doi.org/10.61796/jgrpd.v2i8.1473

Sections Info

Article history:
Submitted: April 28, 2025
Final Revised: May 11, 2025
Accepted: July 25, 2025
Published: August 20, 2025

Keywords:
Basin approach
Sangzor river basin
DEM
First-order basins
Natural resource use

ABSTRACT

Objective: *This study aims to analyze the Sangzor River basin as a distinct geosystem by delineating its geographical and administrative boundaries and assessing its internal structural hierarchy.* ***Method:*** *The research employs a basin approach supported by Geographic Information System (GIS) and remote sensing technologies to determine the spatial extent, sub-basin classification, and natural resource utilization within the Sangzor basin.* ***Results:*** *The findings reveal that the Sangzor River basin, located in the Middle Zarafshan natural geographic district and spanning the Jizzakh and Samarkand regions, consists of 78 identified sub-basins categorized into first-order basins. The study provides precise geographic coordinates, demonstrates the interconnection between tributaries originating from the Morguzar and Chumqor mountains, and identifies key environmental characteristics influencing basin dynamics.* ***Novelty:*** *This research contributes to the field by integrating a basin-geosystem perspective with advanced GIS-based delineation techniques, offering an updated methodological framework for assessing river basin structures and natural resource management in arid and semi-arid regions of Central Asia.*

INTRODUCTION

The founder of the basin approach in geography, which forms the basis of the natural sciences, is considered to be the British scholar R.E.Horton. In 1948, his book “Erosional Development of Rivers and Drainage Basins” was published in Great Britain, where river basins were described as “erosional complexes” [1].

In 1963, V.B.Sochava introduced the concept of the geosystem. Since then, some geographers have defined river basins as geosystems, while others have categorized them as a distinct type of geosystem.

Recognition of the river basin as an inseparable geosystem unites scholars of different perspectives within the basin approach. I.A.Titov viewed the river basin as a geovegetation system, while L.M.Korytniy, S.Y.Sergin, V.M.Smolyaninov, A.Y. Reteyum, and K.N.Dyakonov interpreted it as a geosystem. S.G.Aleksandrov recognized river basins as the most convenient units for geographic regionalization [2], [3], [4]. A.D.Armand considered the basin as a geographic information system, where the river channel acts as a communication channel, providing information about soft material inflow, as well as upstream-downstream changes, such as the structure of terraces and alluvial deposits, which reflect the historical dynamics of erosion.

According to the above, a river basin is a functionally integrated whole system in which the movement of matter within the basin from top to bottom is linked in a chain-like manner. F.N.Milkov [5] writes that natural complexes in a river basin are interconnected, consisting of valleys and small drainage subsystems. This idea has been echoed by foreign scholars R.J.Charly and B.Kennedy, who studied river basins as ecological systems and contributed to directions related to water resource management, conservation of natural environments, and socio-economic development.

L.M.Koritniy emphasizes that the basin is a special spatial unit of the biosphere and represents the most promising focus for multi-faceted study of nature and economy and for environmental management [6], [7]. Today, with rapid advances in information technologies, remote sensing and geographic information technologies (GIS) are used to study various basin characteristics. L.M. Koritniy also notes that each river basin is an interlinked hierarchical geosystem and divides a basin into two parts: tributaries and the hydrographic network [8].

RESEARCH METHOD

The study area is located within the Middle Zarafshan natural geographic district, administratively covering Jizzakh and Samarkand regions, and hydrologically forming part of the Syrdarya basin [9].

The basin corresponds to an intermountain depression bounded by the southern slopes of the Morguzar mountains and the northern slopes of the Chumqor mountains. The Sangzor river, which flows through the central part of the basin and forms a valley of the same name, is 123 km long [10], [11], The total area of the basin is 2580 km2 [12], [13].

The delimitation of the Sangzor basin was carried out through cartographic and field research, as well as GIS-based methods, enabling precise determination of its boundaries and peripheral points.

RESULTS AND DISCUSSION

The boundaries of the Sangzor River basin were delineated using topographic maps and GIS technologies. Its northernmost point lies in the southeastern part of the Qo‘ytosh mountain at 40°15′33″N and 67°23′44″E, while its southernmost point corresponds to the upper reaches of Boyqo‘ng‘irsoy on the Uzbekistan–Tajikistan border 39°33′07″N, 68°11′35″E. The easternmost point is located in the section where the Morguzar mountains separate from the Turkiston range 39°38′38″N, 68°19′45″E, and the westernmost point lies on the eastern slope of the G‘o‘bdun mountains 39°55′02″N, 67°17′25″E, see Figure 1.

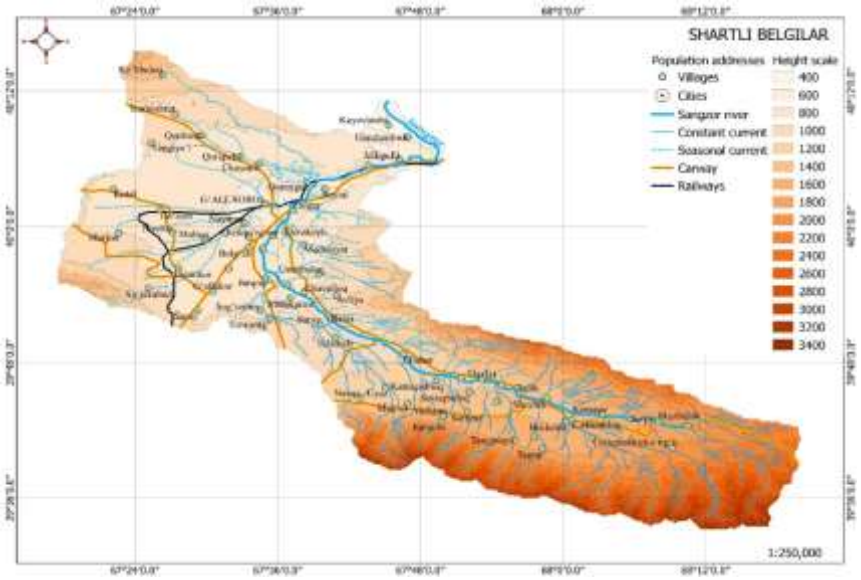

Figure 1. Natural map of the Sangzor River Basin

The basin widens from southeast to northwest, reaching 40–42 km at its widest, while narrowing to 16–17 km towards the east [8]. Administratively, the basin covers most of Baxmal and G'allaorol districts, Jizzakh city, and parts of Sharof Rashidov and Bulung'ur districts, see Table 1.

Table 1. Location of the Sangzor River basin by district and city area

№	Name of administrative unit (district)	Total area of the district, thousand km²	Area within the basin, thousand km²
1	Bakhmal district	1,86	1,34
2	Bulungur	0,76	0,03
3	Gallaorol district	2,0	1,12
4	Jizzakh city	0,1	0,03
5	Sharof Rashidov district	1,4	0,06

There are more than 100 rivers and streams in the basin. The right tributaries (originating from the southern slopes of the Morguzar mountains) are mostly seasonal, such as Shamasoy, Yettiqo'ton, Quduqsoy, Xo'jasoy, Xumsasoy, Shaybek, and Otkamar. Major left tributaries (originating from the Chumqor mountains) include Guralash, Boyqo'ng'ir, Ko'kjar, Tangatoptisoy, Jo'm-Jo'm, and Baxmazorsoy [14], [15], see Table 2.

Table 2. Streams flowing into the Sangzor River

№	Streams name	Length, km	Basin area, km²
	Right tributaries (streams flowing down from Mount Morguzar)		
1	Jantaka	14	86
2	Okmulla	6	23
3	Shaybeksoy	7,5	42
4	Yettikoton	6,7	14

№	Streams name	Length, km	Basin area, km²
5	Kuduksoy	-	-
6	Turgunsoy	-	-
7	Khojarsay	14	37
8	Tuyatola	9	23
9	Otkamar	-	14
10	Uzunbuloksoy	16,5	40
11	Umarsoy	18	-
	Left tributaries (streams flowing down from Chumqor Mountain)		
1	Guralashsay	16,7	67
2	Baykungirsay	22	65
3	Kokjar	24	235
4	Dangara	13,5	-
5	Oqqorgan	19	48
6	Tangatoptisay	21	65
7	Sutariqsay	14	-
8	Jom-Jom	18	45
9	Baxmazarsay	21	54
10	Navka	24	94

During the study, tributaries flowing into the Sangzor were identified as first-order basins, and their natural geographical characteristics were analyzed as distinct geosystems. Altogether, 78 sub-basins were identified. Basin delineation was conducted using WGS-84 UTM 42N projection in Global Mapper, MERIT DEM Hydrio digital elevation model, and the Global Watershed application. The basin boundaries were rasterized and refined in ArcMap 10.8, and subsequently divided into sub-basins using QGIS, see Figure 2.

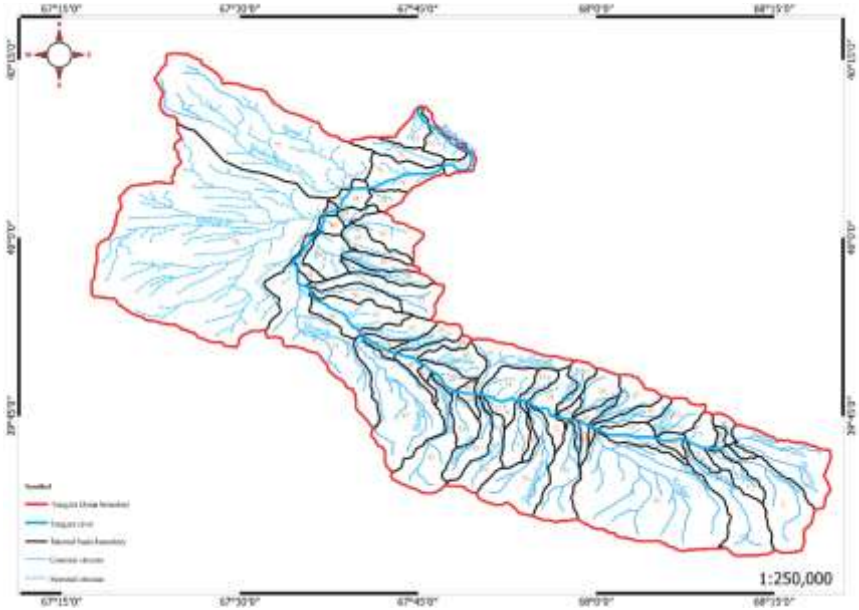

Figure 2. Map-scheme of the inner basins of the Sangzor River Basin

During the research work, the area sizes, natural geographical features, and nature use issues of the allocated basins were revealed.

CONCLUSION

Fundamental Finding : The study successfully delineated the Sangzor River basin using topographic maps, GIS technologies, and digital elevation models, identifying 78 sub-basins and detailing their geographic coordinates, hydrological characteristics, and administrative distribution. This confirms that the Sangzor basin functions as a complex geosystem with spatially interlinked tributaries from the Morguzar and Chumqor mountain ranges. **Implication :** The findings provide a scientific foundation for sustainable watershed management and environmental planning in the Jizzakh and Samarkand regions, emphasizing the potential of GIS-based approaches in optimizing land and water resource utilization. **Limitation :** However, the study is limited by its reliance on secondary data and a lack of in-situ hydrological and ecological measurements, which may constrain the precision of environmental impact assessments. **Future Research :** Subsequent studies should integrate real-time hydrological monitoring, climate modeling, and socio-economic analyses to develop a comprehensive framework for adaptive basin management and regional ecosystem sustainability in Central Asia.

REFERENCES

[1] R. E. Horton, Erosional development of rivers and drainage basins. Moscow: Foreign Literary Publishing House, 1948.

[2] A. Urazbayev, U. Abdunazarov, Sh. Ibroimov, O. Joniyev, S. Safarov Basin Concept In The Rational Use Of Land And Water Resources Of The Irrigated Areas Of The Current Delta Of The Amu Darya. Nat. Volatiles & Essence. Oils, 2021; 8(4): P.15553-15562.

[3] A. K. Urazbayev, "Methodological foundations of using the basin concept in studying the natural and economic system of irrigated areas," SamSU Scientific Bulletin, no. 5, 2021.

[4] A. Urazbayev, U. Abdunazarov, Sh. Ibroimov, O. Joniyev, and S. Safarov, "Basin Concept in the Rational Use of Land and Water Resources of the Irrigated Areas of the Current Delta of the Amu Darya," Natural Volatiles & Essential Oils, 2021.

[5] F. N. Milkov (ed.) Prikhoperye. - Voronezh: VSU Publishing House, 1979. - 164 p.

[6] L. M. Korytny, Basin concept in nature management. Irkutsk: Institute of Geography SB RAS, 2001.

[7] L. M. Korytny, "The Basin Concept: From Hydrology to Nature Management," Geography and Natural Resources, 2017.

[8] I. V. Zherelina, Basin approach in environmental management. 2010.

[9] L. N. Babushkin and N. A. Kogai, Physical and geographical zoning of the Uzbek SSR. Tashkent: Tashkent State University, 1964.

[10] I. A. Hasanov, P. N. Gulomov, and A. A. Kayumov, Natural geography of Uzbekistan (Textbook), Part II. Tashkent, 2010.

[11] L. B. Jumanov Natural geographical features of the territory of Bakhmal district // Geographical research: innovative ideas and development prospects. Proceedings of the II international scientific and practical conference. – Tashkent: 2023. p. 45-50.

[12] N. D. Qosimov and I. Y. Zikirov, "GIS analysis of the geographical location of the Sangzor river basin," Economy and Society, no. 8(111), 2023.

[13] K. A. Khakimov, Application of landscape planning in the use of the nature of Bakhmal

district. PhD dissertation, Tashkent, 2022.
[14] Sh. A. Kholmuradov, Evaluation of recreational potential of mountain landscapes of the Turkiston-Nurota system. PhD dissertation, Tashkent, 2021.
[15] N. R. Alimkulov, Assessment of landscape-ecological conditions of Jizzakh region. PhD dissertation, Tashkent, 2009.

*** Qosimov Nurmuxamad Dursinovich (Corresponding Author)**
Jizzakh State Pedagogical University, Uzbekistan
Email: qosimovnurmuxamad1@gmail.com