Lapas A. Alibekov[1], Saodat L. Alibekova[2]
[1] Samarkand State University, Department of Physical Geography and Geoecology; University Boulevard 15, Samarkand, 703004 Uzbekistan; Tel: (+998662) 2310636
* **Corresponding author**; e-mail: davlat1982@yahoo.com
[2] Samarkand State University, Department of Economical Theory; University Boulevard 15, Samarkand, 703004 Uzbekistan; Tel: (+99862) 2332960

THE ROLE OF ENVIRONMENT IN SUSTAINABLE DEVELOPMENT OF SAMARKAND

ABSTRACT. The emergence, formation, and development of the city are largely connected with its landscape position. The first stage of Samarkand's existence may be referred to as "river civilization". Over the course of development of the city, the nature and intensity of interaction of the population and economy with its landscape have undergone changes; there is a distinct general pattern: dependence on the landscape. This was largely the reason for its sustainable development for many centuries. This fact should be considered in future activities in landscape and spatial planning.

KEY WORDS: natural landscapes, landscape pattern, living conditions, sustainable development, historical environment.

INTRODUCTION

By the Decision of the General Conference of UNESCO at its 33rd session on October 20, 2005, and the Decree of the President of the Republic of Uzbekistan on July 25, 2006, Samarkand celebrated its 2750th anniversary on August 25–30, 2007. The celebration of the anniversary was internationally recognized. In May 2007, Samarkand hosted the International Conference "The Value and Place of Samarkand in History of Universal Cultural Development". In this paper, we demonstrate the importance of geographical factors in sustainable development of the city of Samarkand.

THE OBJECT OF RESEARCH

The oldest state formations in Central Asia were Bactria, Khorezm, and Sogdiana. Sogdiana occupied the Zaravshan valley and adjacent Kashka-Darya basin. The main city of Sogdiana was Samarkand.

In the Zaravshan valley, irrigation based agriculture continued to evolve and improve. Horticulture and viticulture were very sophisticated.

Edward Schaefer, the largest orientalist (researcher of Chinese culture of the Tang epoch), University of California, in his famous book with the exotic name of "The Colden peaches of Samarkand" [Schaefer, 1981], wrote: "The title of this book – "The Golden Peaches of Samarkand" – was chosen because it resembles may things at the same time: the golden apples of the Hesperides, the peaches of immortality, Chinese legend places far to the West, the "Golden journey to Samarkand" by James Elroy Flecker, and the melodies of Frederick Delius "The Road to Samarkand" for Flecker's play "Hassan." But if you leave out these vague associations with the myths and music, the golden peaches existed in reality. Twice in the VIIth century, the Samarkand kingdom sent these unusual yellow peaches as a gift to the Chinese court. "They were as big as goose eggs, and because the color was like gold, they were called: the golden peaches. A few young trees, which produced these regal fruits were brought by the embassy convoy through

the desert Serinda and planted in the palace gardens of Chanani. Now we can only guess what sort of a peach it was and what was it taste. Attractive, due to their inaccessibility, the golden peaches of Samarkand symbolized, in the Heavenly Empire Tang, all exotic and desirable, all unknown, and appealing" (p. 14). Further, Edward Schaefer wrote: "Although the fruits once existed as a "reality", they have become mythic subjects, whose life went on in the form of a literary image, metaphor. In the word format, they belonged to a much greater extent to the world of representations, imaginary, than to the world real, physical" (p. 15).

Handicrafts, especially ceramics, as well as the art of building, became increasingly important. In nearby mountain ranges Karatau, Nurata, Gobduntau, and others, gold, copper, iron, and precious stones, including turquoise, were mined. In Sogdiana, there flourished urban settlements, among which Samarkand was, undoubtedly, the largest and busiest commercial and cultural center. In Samarkand, a great "lead channel" was built, which was similar to the famous aqueducts of Rome.

Extremely favorable geographical position, the relatively cool climate, abundant natural sources with excellent water, which is not without reason called Samarkand "Obi-Rahmat" – "mercy water", the proximity of the mountains with abundant game, the large Zaravshan River running nearby that served, from time immemorial, for timber rafting from the mountains – all this provided favorable conditions for human settlements in the area where a few centuries before our era, fortifications, castles, stately buildings, and Samarkand mosques emerged.

Sogdiana and its metropolitan center – Samarkand, in all phases of their history, played a crucial role in the relations between people of East and West and in establishment of trade and cultural contacts between them. Of particular significance was the fact that Samarkand had a favorable geographical position at the crossroads of caravan routes on their way from north to south and from west to east, which defined it as the dominant center, accumulating relaying cultural achievements of the great civilizations of antiquity and the Middle Ages. But Sogdians themselves, in turn, were spreading the achievements of their civilization to the West – to Europe, and to the East – to Japan and China. This was made possible by the creation of the great transcontinental road that, in science, received the name of the Great Silk Road.

THE NATURAL ENVIRONMENT OF SAMARKAND AND ITS ADJACENT TERRITORIES

The geographical location and natural environment played an important role in the formation, establishment, and sustainable development of Samarkand. Samarkand has a variety of natural conditions. Within its territory, very different landscapes of Central Asia are in direct contact. The Zaravshan River basin and especially its middle part – the Zaravshan valley, where Samarkand is located, has been one of the centers of the world's civilization; from ancient time it was considered one of the best areas for settlement. The territory of the city, which lies in the center of the Zaravshan basin, is at the junction of the two landscapes: the northern part is in the terraced alluvial plain of the Zaravshan River valley, the southern part is in the proluvial inclined plain. From the south, the city borders (15–20 km) with the powerful mountains of the Zaravshan Range; from the north and north-east – the Turkestan Range and its continuation, i.e., the Gobduntou and Karagchitou.

The middle part of the Zaravshan valley is generally flat and reaches, at the meridian of Samarkand, 40–50 km in width. The mountains and their ridges, as well as the basin itself, are gradually declining in the direction from east to west reaching, at the meridian of Samarkand – the Zaravshanskiy Ridge, 1,680 m above sea level (The Ottoman-Karachi Pass).

All these above-mentioned geographical features of Samarkand determine the specificity of the natural conditions of the city. The natural conditions and geographical environment of these different landscapes, which has long been used by man in his productive activity, have promoted concentration, in the middle of the Zaravshan valley, of economy and population. At the connection of mountains and plains, orographic, climatic, and hydrological, (the presence of numerous permanent springs) conditions create the best environment for the development of a diversified economy and for living. The development and expansion of Samarkand occurred at the contact of mountainous-plain middle part of the Zaravshan basin, within a vast piedmont plain, suitable for the development of gravity irrigation that carried many tributaries of the Zaravshan River (Agalyksay, Amankutansay, etc) to it.

The mountain ridges that surround the Zaravshan valley, affecting the circulation of the atmosphere, contribute to a year-around prevalence of east (26–43%) and southeast (32–35%) winds that "air" the Zaravshan valley and fill it with clean mountain air. Therefore, Samarkand and the surrounding areas have a relatively cool climate.

HISTORICO-GEOGRAPHICAL ANALYSIS

The book "Samaria" written in the XIXth [Abu Tahir Hodja, 1889] states: "The city's climate is fine and temperate – it is absolutely not the cause of predisposition to disease and death. For this reason, Samarkand is called "firdaus monand" – ***like the paradise***. Summer time in Samarkand is relatively hot and cold times are considered moderate. Blowing from all directions, a nice, quiet breeze and the air multiplying the joy, bring peace of mind".

The natural conditions of the Zaravshan River basin (especially in the middle of its course) during the Quaternary have been favorable for the life of primitive people, as evidenced by the abundance of archaeological monuments of different eras. At present, a few hundred of them have been found – cities, castles, villages, and sites. Abundance of the Stone Age artifacts and their nature leave no doubt that the Zaravshan River basin was one of the most habitable areas of Central Asia.

In prehistoric times, and at the dawn of civilization, people usually lived in caves that were formed in the limestone due to the slow but continuous dissolution of calcium carbonate in natural waters. The northern slopes of the Zaravshan Ridge are composed of Zaravshan karst-forming Devonian limestones. Therefore, the Zaravshanskiy mountains have abundance of ancient karst caves. It is these simple natural factors (the cave in the limestone and the presence of water in small canyons, forested mountain slopes, etc.) that have determined the location of some of the earliest settlements that have arisen in those ancient times when our ancestors had to find shelter. For this reason, the northern slopes of the Zaravshan mountains bordering the Samarkand territory were populated from ancient time and there were discovered a number of Paleolithic sites: Aman-Kutan, Takaliksay, Kuturbulak, Zirabulak, etc. Among them, the world-renowned man-site – Aman-Kutan cave (south of Samarkand, 40 km). It is located on the northern slope of the Zaravshan Range at 1,400 m. About 100 thousand years ago, the cave was inhabited by primitive hunters of the Old Stone Age. Another monument dating back to the middle Paleolithic period – Takaliksay cave, located 50 km southeast of Samarkand, at an altitude of 2000 meters above sea level was also inhabited by primitive hunters.

In the caves of Aman-Kutan, Takaliksay, and others, a handful of Neanderthals huddled; they spent most of their time in the foothills to the south of Samarkand and hid in caves from the weather and predators. In the Zaravshan valley, as elsewhere, the first dwellings of primitive man were mainly caves. Later prehistoric man "came out of the cave" and began exploring new territory not only in the mountains, but in the foothills also.

An example is the Neolithic (New Stone Age) man-sites in the foothills of the northern slope of the Zaravshan Ridge in the villages of Tym and Sazagan, located 27 km south-west of Samarkand on the Sazagansai bank, who hunted, fished, and gathered edible wild plants.

In 1939, in the heart of the city of Samarkand on the right side of the Chashma-Siab valley, the Samarkand Upper Paleolithic man site was discovered. The site is a long-term settlement on the bank of a small stream gully; it was the primary location of activities of the primitive man. The Samarkand site relates to a much older, than Aman-Kutan and Takaliksay, time and is dated with the second half of the Old Stone Age.

In the Bronze Age (second millennium BC), the main sectors of the economy, characteristic of previous eras, lost their role; in the foothills, there emerged new industries – agriculture and animal husbandry, dramatically increasing productivity. The Bronze Age monuments have been studied in the villages Muminobad and Jans near Katakurgana and other places.

Samarkand originated in a place inhabited in the prehistoric era. Abundant mountain streams (now called Aman-Kutan, Agalyksay, Sazagan etc.), formed on the northern slopes of the Zaravshan Ridge, flew toward the Zaravshan valley. Wild bushes in the lower reaches of the streams and the Zaravshan valley had abundant supplies of water, fuel, game, and fruit. The Zaravshan River valley, almost within its entire length, was covered with dense riparian thickets and was an ideal habitat for many species of animals. These natural geographical conditions were favorable to the settlement of the region of Samarkand by tribes of hunters and gatherers of the Upper Paleolithic and Neolithic and by farmers and herdsmen of the Bronze Age.

Specifically the nature of the topography determined the location of the first settlements that eventually turned into a great city of Samarkand.

The town was founded in the heart of Sogdiana as a stronghold of the Sogdiana alliance of tribes and always remained an important location in the Middle Zaravshan. This was due to the geographic, strategic, and economic advantages of the location of the city.

Natural factors have always been essential elements of the city, identifying its location and territorial structure. It is known that the most favorable sites in choosing a place to lay-out a future city, is an elevated place, so farming and stock-raising tribes chose the hilly Afrosiab upland, located north of modern Samarkand, the ancient part of town, and "a long frozen" Afrosiab settlement – this is the territory of ancient and medieval Samarkand. The geographical location of Afrosiab was advantageous for defensive purposes: it was surrounded on three sides by the natural channels with deep ravines. The urban settlement on Afrasiab emerged in the IX–VIIIth centuries BC.

Samarkand, like all cities of the world, was formed and developed as a city on the common objective laws of historical development of human society – the development of crafts, trade, centralization of power, and the emergence of large public entities, etc. The inhabitants of the valley were able to create amazing material and cultural values.

The natural environment had a strong influence on the emergence and growth of Samarkand, on the originality of this great city. The influence of environment on the development of Samarkand was versatile;

it depended on the social system and the level of development of productive forces. At different time, different environmental conditions and natural resources were the primary factor.

In the beginning, the spatial factor had great importance in the formation of Samarkand. The spatial factor was manifested in the emergence and development of Samarkand in the form of a combination of several elements of nature: its location, proximity to the rivers of the Zaravshan and Zaravshan Ridge, and other opportunities for communicating with other localities. When all the elements harmonize with each other, a structure, called by geographers the junction area, is formed. There, large cities usually emerge.

The Zaravshan River is the natural junction structure formed by natural elements. In ancient time, before railroads and highways, the Zaravshan River was one of the main ways by which people and goods were moved (e.g., timber rafting down from the mountains). Foot and horseback routes stretched along the Zaravshan River valley. People fished in the river; the valley was used as hayfields, vegetable gardens, etc.

The territory of Samarkand is extremely rich in groundwater at a depth of 1 to 20 m. As the distance from the Zaravshan mountains increases, groundwater comes closer to the ancient surface; at low sites of the valley, there are active springs with substantial flow rate (see Fig. 1). In ancient time, the springs were the main water resources of Samarkand, which is supported by a fact that there is an Upper Paleolithic man-site found on the right bank of the Chashma-Siab creek feeding from springs. Undoubtedly,

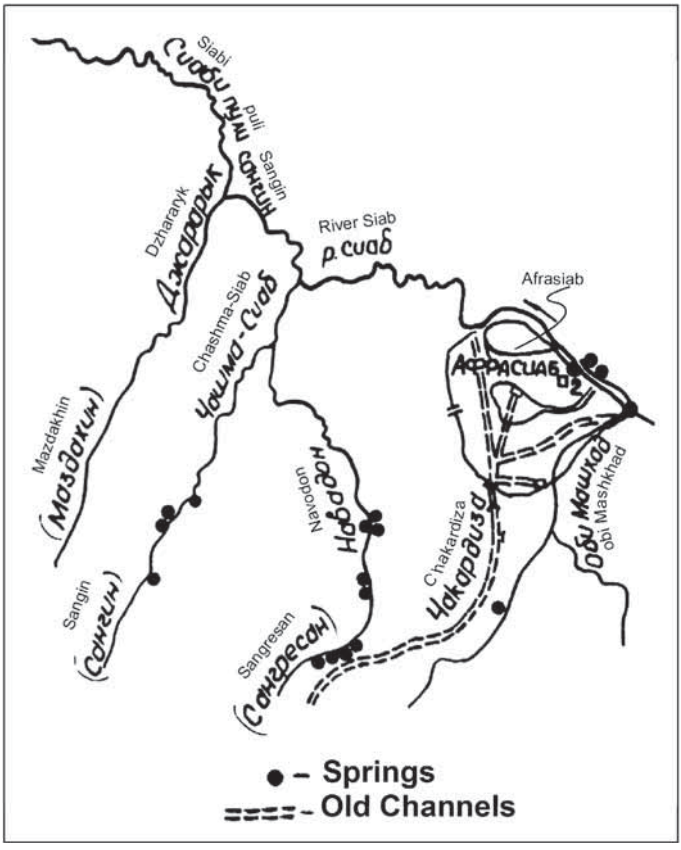

Fig. 1. Schematic representation of the irrigation system of ancient Samarkand (first centuries BC; based on [Mukhamedzhanov, 1969])

the springs located in the areas of planned construction of the city, could not but attract the attention of the ancient city planners [Mukhamedzhanov, 1969].

Probably, in ancient time, the springs made their way and opened in several places within the territory of the modern Samarkand along its merideian. Forming, on their way, small puddles and swamps covered with bushes and reeds, waterways of springs flew into the Siab River and into the Zaravshan River through it. Urban channels Obi-Mashhad, Navodon, Chashma-Siab, etc, may be considered natural creeks of spring feeding. The configuration of the river network has had a noticeable effect on the layout of the city in the past and at present.

Navodon was the largest of the streams of Samarkand with the total production rate equal to 0,072 m^3/sec (or 72 l/sec, which is more than 6 mln. l/day) [Butov, 1932]. This volume of water could meet the everyday needs of not only ancient Afrasiab, but densely populated Samarkand of the Timur and the Timurid epoch [Mukhamedzhanov, 1969].

In addition to a very advantageous location of the old Samarkand, many of its aspects of life and its appearance were influenced by the dense forest cover of the Zaravshan mountains. An expert on Central Asia, Professor M.E. Masson believed that in ancient time, the mountains between Shahrisabz and Samarkand were covered with thick forests [Masson, 1966]. Most likely, it was a juniper forest. The life of all peoples inhabiting places where the juniper grows has long been associated with this tree. Specifically the juniper beams still retain many of the arches of the ancient buildings of Samarkand. When people learned how to smelt metal, juniper still played an important role: juniper charcoal was used in smelting. With the development of civilization, juniper continuously found new applications. There can be a number of historical examples, like those presented above. They convince us that the fate of ancient Samarkand largely evolved depending on the local environmental conditions and the surrounding Zaravshan mountains.

It should be noted that a variety of environmental conditions of the mountains and foothills of Central Asia, contrasting sharply with poor and monotone surrounding arid plains, contributed to the formation in the foothills of the ancient civilizations of Central Asia. The proximity of the desert plains created continuing threat for the population and the economy, both climatic (drought, dust storms, etc.) and military (from the nomadic tribes). This forced the residents of foothill plains to tie their fate to the mountains, especially in the early stages of development. The proximity to the mountain areas predetermined emergence of transhuman grazing and dry farming. The latter ensures the stability of yields. Later, the residents learned how to use the waters of mountain streams. The pockets of ancient cultures found in the foothill plains of Central Asia point to the fact that favorable conditions of the surrounding mountains and plains have long been strategically and purposefully used by people.

In general, the mountains were a powerful stabilizing factor in economic activity for the early civilizations of Central Asia. The foothills of Central Asian are populated especially densely. They are associated with rich oases and last settlements. Almost all of the numerous cities and all of the capitals of the republics of Central Asian countries (Ashgabat, Dushanbe, Tashkent, Bishkek, Alma-Ata) are located in the foothills and have had a long and active life.

However, it should be noted that the analysis of the history of the ancient cities and their growth and decline clearly reflects the rise and fall of the ancient civilizations in the Zaravshan valley.

Professor V.M. Masson [1966] called Central Asia a "country of thousand cities". Indeed, in this region in the historical period, there were thousands of cities. Only in the Zaravshan valley, there were hundreds of cities, such as

Vardanzi, Varakhsha, Paikend, etc. Many towns and villages have disappeared. The remains of ancient settlements are under the aeolian sands or became undistinguishable small hills.

However, in existing urban areas, primarily in Samarkand, there are magnificent medieval monuments that remain the object of universal admiration.

What is the cause of prosperity of the ancient Samarkand? Here, again, we must emphasize the role of the environment and geographical location. The territory of Samarkand is located between the mountain ranges (Zaravshan and Turkestan) and the Zaravshan River valley, i.e., in the foothills (piedmont plain). Indeed, almost all major cities of Central Asia emerged in the foothills. Foothills (the piedmont plains) of Central Asia are the contact zone between highland and lowland areas; it is the band of emergence and zenith of ancient civilizations and the modern world [Alibekov, 1992].

The major cities found at the junction of mountains and plains prove to be practically immortal. Apparently, there is some critical size at which a city as a phenomenon of political, economic, and cultural life becomes indestructible. The fully functional structure of the territory where it is founded is also important.

In Central Asia, functional connections are oriented along the foothills, i.e., they represent "longitudinal" links. The fact that in Central Asia and Kazakhstan, the main transport axis goes along a strip at the joint of the mountain and lowland areas is no accident; it has only enhanced, in this belt, the conditions for concentration of households and population, caused primarily by the natural-geographical situation itself.

In fact, the railway, high-voltage line, oil, gas, and other product pipelines, and irrigation and dry channels here are aligned, in general, in parallel along the mountains or along the ridges interwoven into a powerful infrastructure.

Foothills, because of the diversity and mobility of environmental factors, react in a more versatile way and are generally more elastic. The natural links in the landscapes may be deformed but do not break, and it is encouraging. Therefore, due to these natural features, the foothills of Central Asia have always been an arena of civilization.

Thus, the foothills exhibit more stable conditions. Thus, for example, the flow of the Zaravshan River is considered relatively stable: 34% of its flow is fed by ground waters, 31% – glacier water, 34% – snow water, and only 1% – rainfall. For this reason, the seasonal regime of the Zaravshan River depends little on weather conditions and rainfall. In a drastically dry year (1917), the Zaravshan flow was only 9% lower than the multi-year average; the flow of other rivers dropped 40%. Stability of flow could not but promote sustainable prosperity of Samarkand.

The city can neither be studied nor designed separately from its natural and geographical environment. However to date, very little attention is given to the environmental conditions in cities and existing urban landscapes, as well as to the impact of the urban economy on the interaction of individual components of the landscape. However, in urban areas, specifically these factors determine the territorial division into individual districts and even city zones with different layout and different degrees of development.

It is known that the natural landscape conditions of a city have a great impact on its inner and outer appearance – the character of the buildings, architecture, structures, and squares. Despite a very strong effect of humans on nature within the city, the city just changes and adapts to the city's improvement; but it still preserves the main features of the natural (native) landscape.

The territory of Samarkand and its adjacent areas are not uniform physico-geographically;

they are located at the junction of three natural systems that divide the city and the surrounnding areas in three sharply distinct parts: 1) sloping piedmont-flat proluvial natural system, 2) hilly-ridge Paleozoic natural system with residual hills, and 3) terraced alluvial-plain natural complex.

In Samarkand, until the second half of the XXth, century there remained relatively favorable living conditions for the population and for preservation of historical monuments in their original form. However, due to the anthropogenic load, i.e., increase in population, transport, and industry, a relative balance in the system "city-nature-man" within Samarkand and its surrounding areas was broken. Now, most of the Samarkand territory and its suburbs are associated with adverse environmental conditions. This has led to an increase in the overall disease incidence, the rapid destruction of the exteriors of the buildings, and other negative phenomena. Adverse geotechnical processes and phenomena are developing; they can have a profound impact on the preservation of historical monuments.

CONCLUSIONS

The history of Samarkand reflects centuries of experience of the people, reflecting the climatic conditions of the city and its surrounding landscape. The traditional type of Samarkand buildings helped creating a favorable living environment. Samarkand of the Timur era represented a model of an environmentally friendly city. The city was surrounded by thirteen gardens – a broad green ring.

Ambassador from distant Spain Ruy González de Clavijo who visited Samarkand in 1404, wrote: "Samarkand lies on the plain. It is surrounded by orchards and vineyards. There are so many of these orchards and vineyards that when approaching the city, you see the forest of high trees and, in the middle, the city itself. The city and the gardens have many aqueducts" [In: Aleskerov, 1973].

The modern territory of Samarkand is a special and unique type of ecosystem (landscape); it is an anthropologic-environmental system that includes the natural base, urban population, and urban environment not only with its material substrate, but with specific socio-cultural space, i.e., intellectual, language, and communicative, as well.

Residents of Samarkand and the surrounding areas came from different cultures and have different historical experience of inhabiting different landscape niches; they have developed their own and often unique form of social adaptation to the environment, their distinctive "genetic code", and original way of life; to some extent, all that allowed maintaining stability in specific historical and geographical environment. All that is the guarantee and imperative of sustainable development, as far as it possible, in today's ever more globalized world. ■

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Lapas A. Alibekov – professor, Head of the Department of Physical Geography, Samarkand State University. D.Sc. (in geography), Honorary Professor. His main research interests are: physical geography, environmental protection, and desertification. Main publications: The munificence of the desert (1988); Band of life between the mountains and deserts (1992); Ecological geographical issues of the Central Asia (2010).

Saodat L. Alibekova is Associated Professor of the Faculty of Economics, Samarkand State University (Department of Economical Theory), PhD. in Economics. Her main research interests are: economic theory, social aspects of economical and ecological problems, living standards and quality of life of the population. Main publications: Factors and consequences of desertification processes in the mountains of Central Asia (2007, with L.A. Alibekov); Social-economic effects of desertification processes in Central Asia (2007, with L.A. Alibekov); Problems of sustainable development of mountain and piedmont pastures in Uzbekistan (2010, with L. A. Alibekov).