Land and Water Use in the Ili-Balkhash Basin from Paleolithic to Modern Times

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CONTENTS

Abstract

Today a major methodological development of archaeological research is represented by interdisciplinarity, namely the cooperation between archaeology and geographical and environmental sciences. This new approach, called geoarchaeology, is irreversibly changing the archaeological procedures of survey, excavation, documentation and interpretation. The present paper, adopting this point of view, analyzes the forms, factors and phases of landscape colonization in the Ili-Balkhash basin (Semirechie) from Paleolithic to modern times, on the basis of the documentation of the geographical location and chronology of monuments of material culture: settlements and towns, water devices and mines, roads, cemeteries and landscape marks like petroglyphs, henges and cairns. Some classificatory frames are suggested: ecological, topographical, and geomorphological.

The ecological frame results are the most proficient. It is based on the consideration of the relative weight and complex interaction of 6 "*location factors*" (partly natural partly cultural: raw materials, water resources, climate, relief, strategic economic opportunities, and socio-political control) which appear to be of the highest significance not only in the case of Semirechie in Kazakhstan but more generally in arid regions. The relative importance of these factors in determining the location of monuments has changed during history, in connection with non-linear demographic, technic

al-economical and climatic variations. The study ends with a model partitioning the historical development of land and water use in the Ili-Balkhash basin into four periods: Stone Age, Bronze and Early Iron, Middle Ages and Modern period. The other two location frames, topographical and geomorphological, mostly dependent on climatic changes, in some extreme cases will suggest the distinction of sub-periods. A depiction of demographic levels in the region for the whole time span under analysis is also provided.

1. Geoarchaeological approach and method to the landscape colonization of the Ili-Balkhash basin from Paleolithic to modern times.

At present, a high scientific level in the study of archeological objects cannot be attained without complex geological, geomorphological and paleontological analyses. This approach defines a new scientific field called *'**geoarchaeology**'*.

Fifty years after the first pioneering works of Soviet archaeologists such as S. Tolstov and geologists such as V. Andrianov and A. Medoev, a new wave of geoarcheological studies has been resumed during the last 10 years in ***Kazakhstan*** by an interdisciplinary team of scientists grouped as the "Laboratory of Geoarchaeology", mainly with the financial support of INTAS (EU Commission) and UNESCO.

Research has been carried out on monuments of the Paleolithic, Neolithic, Bronze, Early Iron, Medieval and Ethnographic periods, of which their location and patterns have been studied together with the paleogeography and paleoclimate of the region.

The method to collect and analyze the data can be referred to as analytic GIS. It includes the collection of data and sources from earth and human sciences, their mapping through a cartographic software (MapInfo, ArcGIS) enabling the overlayer of thematic maps and images and their storage in a database system made for creating and exporting graphics and tables.

1.1. Paleogeography and paleoclimate

Dealing with a monument or with a cluster of monuments, the geoarchaeologist will study the environmental and ecological conditions that supported the human community who built them and inspired their material and non-material culture. He will study the archaeological matrix that encloses and conserves the monument by documenting not only gross elements (architectural constructions, hardened surfaces, ceramics, metals, big bones) but also some subtle elements such as weak surfaces, micro-facies, distribution of chemical elements, phytolits, pollen and microfauna.

For this purpose, both the landscape surrounding the monument and the sedimentary body (archaeological matrix) that buries and preserves it are submitted to complex analyses: geomorphological, stratigraphic, physico-chemical, lithological, pedological, micro-morphological, paleontological (palinological, paleo-zoological); analyses for the definition of absolute age (radiocarbon and ESR); reconstruction of paleo-geographical and paleoclimatic changes.

Particular attention is dedicated to the reconstruction of the evolution during the Holocene period, atmospheric circulation and the environment because these factors determine the paleoecological features of the habitat and the processes that led to the sedimentation and conservation of the monumental structures. In Kazakhstan these paleodata are collected and elaborated by the specialists of the "Laboratory of Geoarchaeology" who have already provided some paleoclimatic and environmental reconstructions that constitute the basic reference for the calibration of archaeological

data (Fig.7):

– a general reconstruction of the development of regional climate and atmospheric circulation in the mountain and in the plain zones of Semirechie for the quaternary period
– a reconstruction with 150-200 year resolution of the climatic and environmental changes in Semirechie for the last 3500 years
– a model with yearly and seasonal resolution of the evolution of the climatic and hydrological regimes in Semirechie for the last 100–120 years

1.2. Location of cultural monuments

In the case of Semirechie, different and often opposite responses to climatic changes are documented in mountains and plains environments, a fact that throughout history compelled human adaptations by large vertical and horizontal displacements. So the territory constitutes an excellent study-object for the application of the geoarchaeological paradigm to the analysis of the correlation between the development during history of environmental features, human technologies and the location patterns of archaeological monuments.

The location of monuments in Semirechie can be classified from three points of view: ecological, topographical, and geomorphological. The ecological aspect refers to the presence of some economical and ecological determinant factors in the immediate environment, within a meso-scale range of 1-10 km; the topographical aspect refers to the geographical coordinates of the site; the geomorphological aspect consists of the meso-scale specific relief features surrounding the monument and the micro-scale ones supporting it.

- When classified on the basis of the ecological aspect (which in the latest periods manifests as socio-economical), the development of the location of monuments in Semirechie shows the complex role of 6 factors: raw materials, water resources, climate, relief, strategic economic opportunities, and socio-political control.
- The topographical location of monuments consists of the geographical coordinates of their distribution in the territory and is the only aspect considered by traditional archaeological reports. It can give information on clusters and concentrations of monuments, but becomes really significant only when correlated with environmental and ecological features.
- When analyzed from the point of view of the micro-scale geomorphological aspect, the development of monument location shows on one side very homogeneous traits, being that monuments of every epoch favor geomorphological rises characterized by high drainage and visibility; and on the other side shows synchronic geomorphological differences depending on the kind of monument and also remarkable diachronic changes provoked by climatic fluctuations alternating dry and wet phases and affecting the drainage rates of specific landforms.

By far the most important classifiers of settlement location in Semirechie are the 6 ecological factors. Their complex interaction and different weight during history suggests a succession of 4 periods: Stone Age, Bronze and Early Iron, Middle Ages and the Modern period. Topographic location and geomorphological features are sometimes quite significant because they reflect climatic and environmental changes and in such cases will distinguish phases within the 4 main periods.

Hereafter will be presented the forms and factors of landscape occupation in the four phases. Each phase presents: 1. the location and characteristics of the main sites, 2. the forms of land and water use, 3. the six main factors of the location of the monuments.

2. Four phases of land and water use in the Ili-Balkhash basin

2.1. Stone Age (Paleolithic, Neolithic)

Important **Early Paleolithic** (1 million y. – 30.000 BP) sites are found in 3 regions: the North Balkhash, the North Chu-Ili Mountains and the Charyn Canyon. (Fig.1)

The earliest stone tools are *chopping tools* in volcanic rock material (porphyrite) dated to the Lower Paleolithic period found by B. Aubekerov and O. Artioukhova in the Charyn canyon (Aktogai). Other more recent Mousterian stone tools were found in the same area (Aktogai 1-4, Sarytogai, Aktau) closer to the confluence of the Charyn and Ili Rivers[i]. (Fig.2)

Stone tools of Levallois-Acheulian tradition (Lower Paleolithic: 800-150.000 BP) and Mousterian with Acheulian tradition of Levallois flaking (Middle Paleolithic:150-40.000 BP) have been found on open air workshops and camps in the North Balkhash region at the sites of Bale, Semizbugu, Turanga and Kyzyl-Kainar[ii] and in the region of Jambul and Khantau in the North Chu-Ili Mountains (Fig.3). Most of the stone tools are made of black and grey-greenish flint, flinted aleurolit, sandstone and various igneous rock materials.

Late Paleolithic sites are found in North Balkhash, in the Zailiskii Alatau foothills (buried camp site of Maibulak, surficial findings in Degeres and individual findings near Almaty) and in the Ili Valley (Aktau). The richest open air camp-workshops are located near Sayak in the North Balkhash

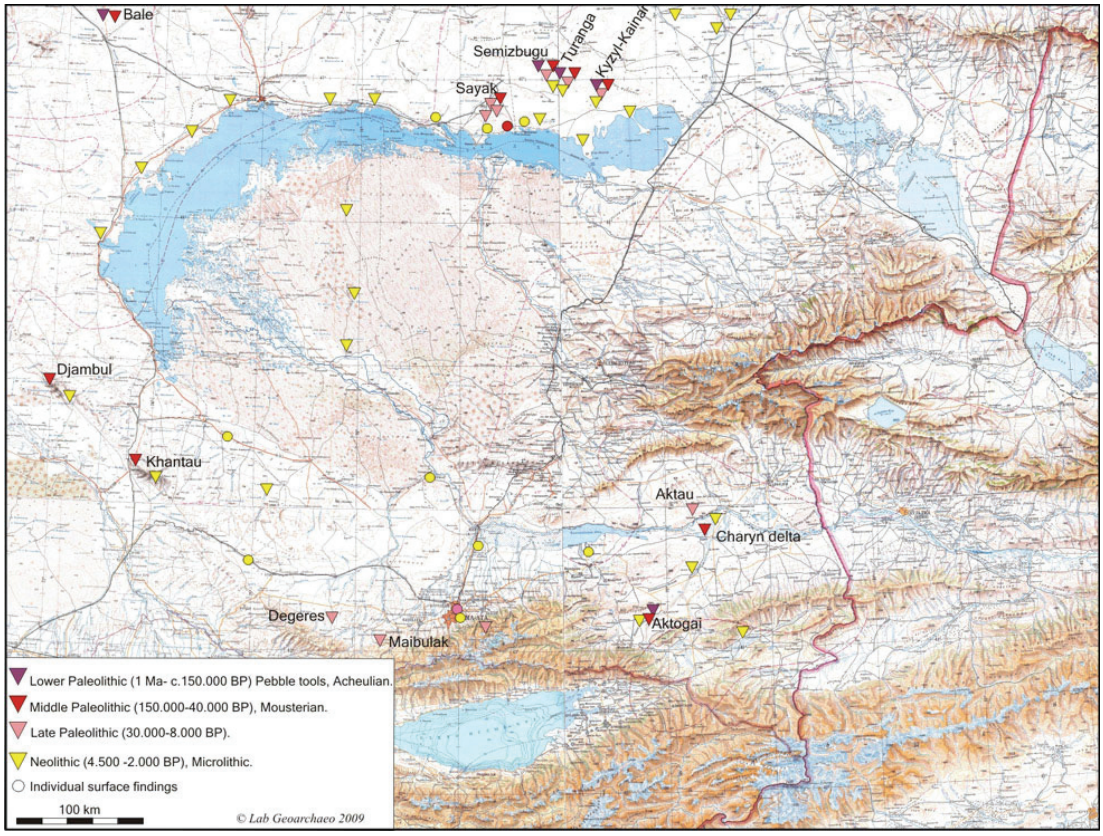

Fig.1 Map of the Stone Age sites in Ili-Balkhash basin

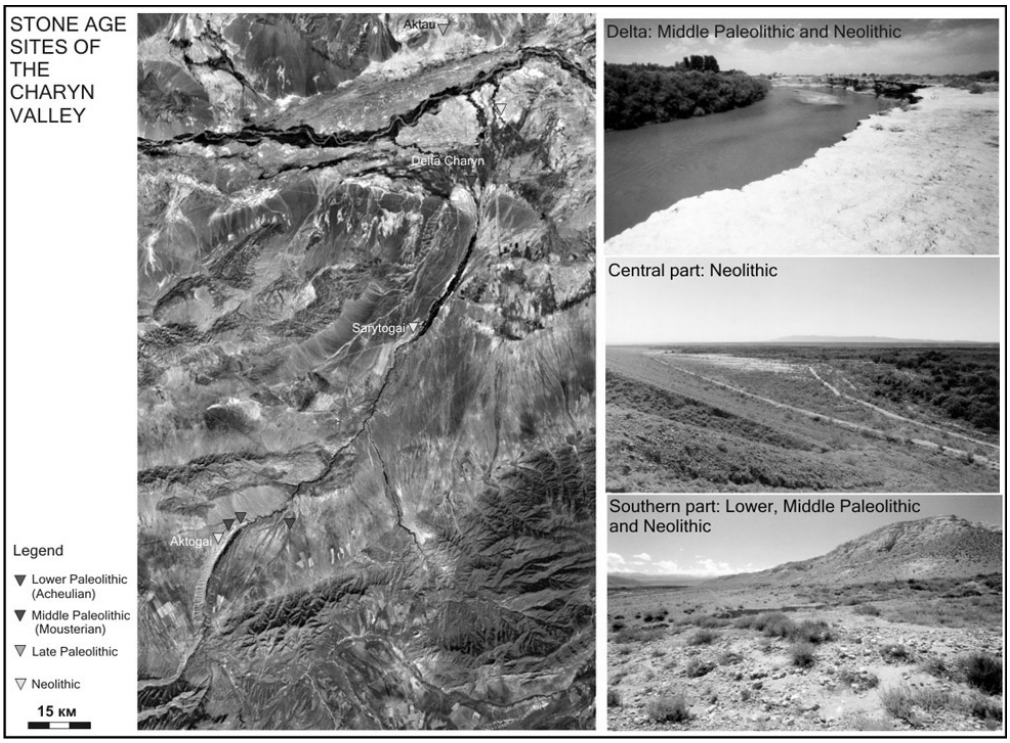

Fig.2 Satellite image and views of the Stone Age sites in the Charyn Valley

region. Most of the stone tools are made from black and grey-greenish flint and aleurolit.

If the **Mesolithic period** seems to have left no traces in Semirechie, with the **Neolithic** period (4,500-2,000 BC) sites characterized by microliths and grey pottery appear in many areas of the Ili-Balkhash basin. The richest concentrations of these two artifacts are found in the North Balkhash, in the piedmonts of the Chu-Ili Mountains and in the delta of the Ili River tributary valleys. The Neolithic sites are generally located in two kinds of landscapes: in the lowest part of the alluvial fans where the groundwater surges and forms lakes and pounds among sand dunes (often at the borders of takyrs) (Fig. 4) like in the lower alluvi-

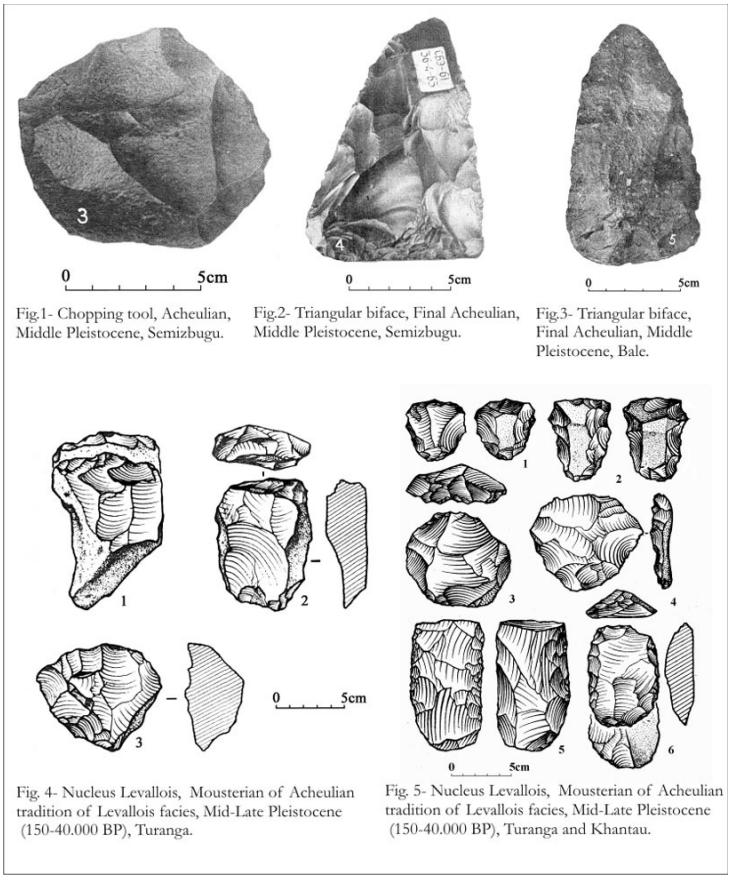

Fig. 3-Paleolithic tools Pre-Balkhash

Fig.4 Neolithic takyrs in the West Chu-Ili Mountains

al fans of the southwestern and northeastern foothills of the Chu-Ili Mountains and along the meanders of river deltas like in the lower part Kazkelen, Talgar, Chilik and Charyn Rivers at the confluence of the Ili River. Most of the materials are chalcedony agates and jasper. The first rock engravings of cup-marks, geometric shapes and animals predating the Bronze Age might be ascribed to the late Paleolithic-Neolithic period[iii].

In conclusion the Stone Age (Paleolithic and Neolithic) of Semirechie spans from 800,000 years BC until the Bronze Age period (second millennium BC). *Paleolithic* remains where flint, igneous and siliceous raw material is dominant are found from the early Pleistocene period; in the North Balkhash regions consisting of effusive-sedimentary materials, they are present starting from the middle Paleolithic across the upper Paleolithic periods. Paleolithic monuments consist of camps of open ground type. They are in general located on the terraces of alluvial fans (today dried valleys) and on their outcrops in the proximity of water where animals are easy targets. *Neolithic* monuments consist of camps and cemeteries. They are located near springs and wells, buried (often among sand dunes) under the colluvial or alluvial remains of small valleys.

We can summarize saying that the Stone Age monuments, as an expression of hunting and collecting communities, are *located in proximity to sources of water and raw materials*.

2.2 - Bronze and Early Iron Age

Bronze Age in Semirechie appears around 2,000 BC in the form of well-sheltered settlements, cemeteries with cist tombs and lithic monuments (petroglyphs, megaliths…)[iv]. The local culture belongs to the Andronovo culture mixing Alakul and Federovo cultures in artifacts (potteries, metallurgy) and funeral style (individual or collective cist tombs often with enclosures). The major sites are found in the mountains and piedmonts of the Jungarian Range (Upper Bien Valley in Kalakai, Muzbulak; Koksu Valley in Eshkeolmes and Begash), of the Ketmen Range (Kegen, Uzunbulak), of the Kungei Alatau (Kulsai), of the Zailiski Alatau (Assy, Kyzylbulak, Butakty, Uzun-Kargaly, Akterek), of the Kendiktas Range (Oi-Jailau) and in the Chu-Ili low mountains (Tamgaly, Kuljabasy, Seriktas, Kopaly, Khantau), in the alluvial bed (Koksu, Charyn) and alluvial fan (Talgar) of large valleys. Several sites are located around the Lake Balkhash (Fig.5).

Iron Age starts around 800 BC in the form of a demographic development, an extensive occupation of the territory, the rise of large cemeteries of kurgans in almost all piedmont valleys, the appearance of farms using irrigation channels and the rise of local mining work and iron metallurgy. The practice of vertical migration inaugurates the period of semi-nomadic pastoralism which continues till today. The various sizes and richness of the kurgans (some with hypertrophic dimension,

adorned weapons and wealthy treasures) reveal a warlike and hierarchised society known as the Saka tribes whose political center was in the Ili Valley according to historical sources. Their southward migration started around 140 BC under the pressure of the Wusun tribes coming from the Eastern Tienshan who continued the Saka traditions in impoverished numbers and forms till the demographic and cultural recession of the third century AD.

The Iron Age sites are found almost everywhere but the main concentrations are found in the alluvial fan of the main piedmont valleys (Lepsy, Aksu, Bien, Kyzylagach, Karatal, Koksu, Chilik, Turgen, Talgar), the alluvial bed and delta of the Ili tributaries (Charyn, Koksu, Chilik, Kaskelen), the gorges of the Chu-Ili Mountains and the mountain shelters which served as summer residences (Assy). The largest kurgan cemeteries are located in the valleys of the River Kegen, Chilik, Turgen, Talgar and along the Ili River (Besshatyr). (Fig.5)

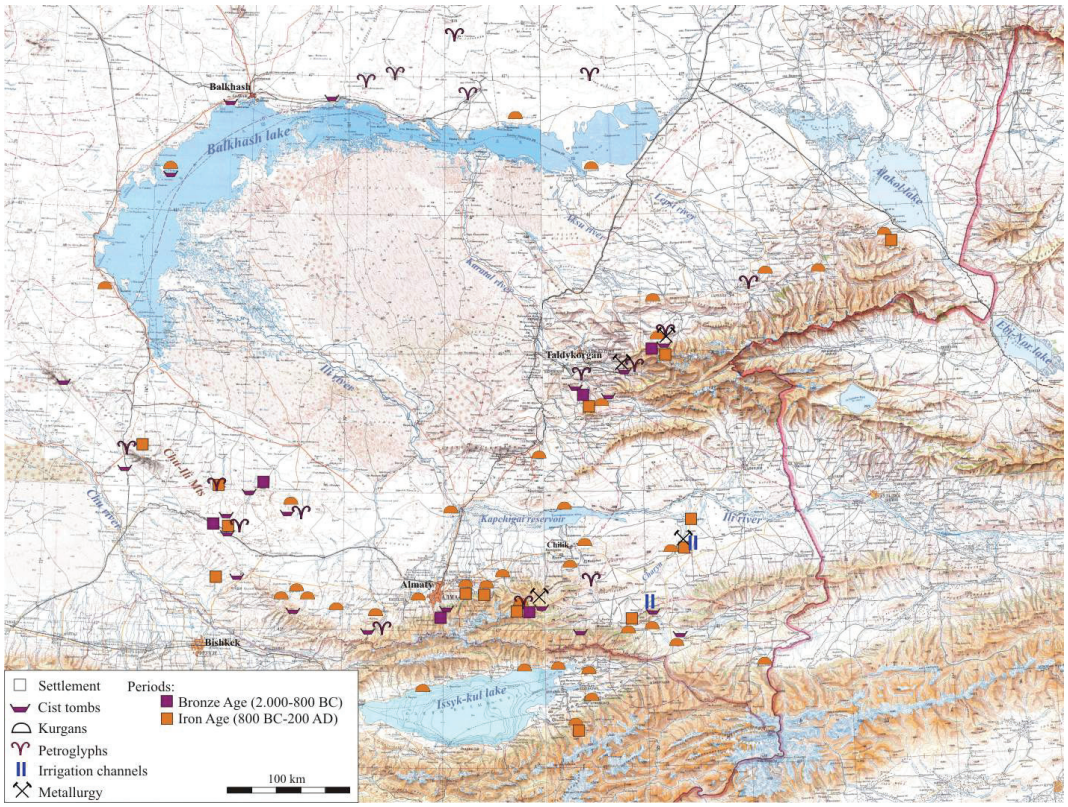

Fig.5 Map of Bronze-Iron Age sites in the Ili-Balkhash basin

The Bronze and Early Iron ages in the Ili-Balkhash basin cover the 2nd and 1st millenniums BC, characterized by mix-farming pastoralist communities. Their monuments consist of settlements, seasonal camps, cemeteries and landscape marks, early irrigation canals (in the Charyn canyon and Uzunbulak), mines and metallurgic workshops (Charyn, Muzbulak) located in various climatic and environmental zones and geomorphological positions.

The climatic-environmental zones are mountains, canyons, piedmonts, and desert oases.

According to their geomorphological position, settlements are distributed: in the mountain zone (Tienshan, Jungarian range) in valley terraces and remains of moraines; in the piedmonts on alluvial fans; in hilly semi-desert areas (Chu-Ili Mountains, Fig.6) on foothill deposits, alluvial fans and valley terraces; in plains around active streams, ponds and springs. Necropolises and barrows are

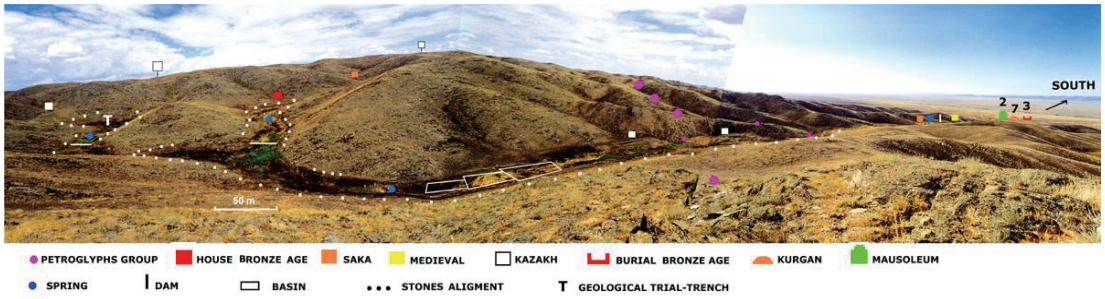

Fig. 6 Cultural landscape of Chu-Ili Valley from Bronze Age to modern times

always located in dry positive forms of the relief-like inter-river areas and relict elevations.

The location patterns of both the Bronze and Early Iron ages monuments show a basic similarity by being *not any more dependent on the proximity of raw materials.* Their location witnesses the existence of improved transport capacities and an efficient system of exchanges; and, as an expression of pastoralist communities, *is determined in a complex way by water, climatic conditions and relief.*

Climatic changes in the Ili-Balkhash basin deeply affect the distribution of humidity and seasonal stockbreeding opportunities and through that, strongly condition the distribution of vegetal zones and, with them, the altitude and geographical location of human and in particular pastoralist habitats. A deep change of climatic conditions at the turn of the 1st millennium BC determined significant switches of vegetal zones and with them the topographical location of monuments, so that the period of the 2nd-1st millennium BC, together with a basic homogeneity of settlement patterns from the point of view of the ecological location factors, shows by geographical considerations, a further subdivision into two phases: Bronze and Early Iron.

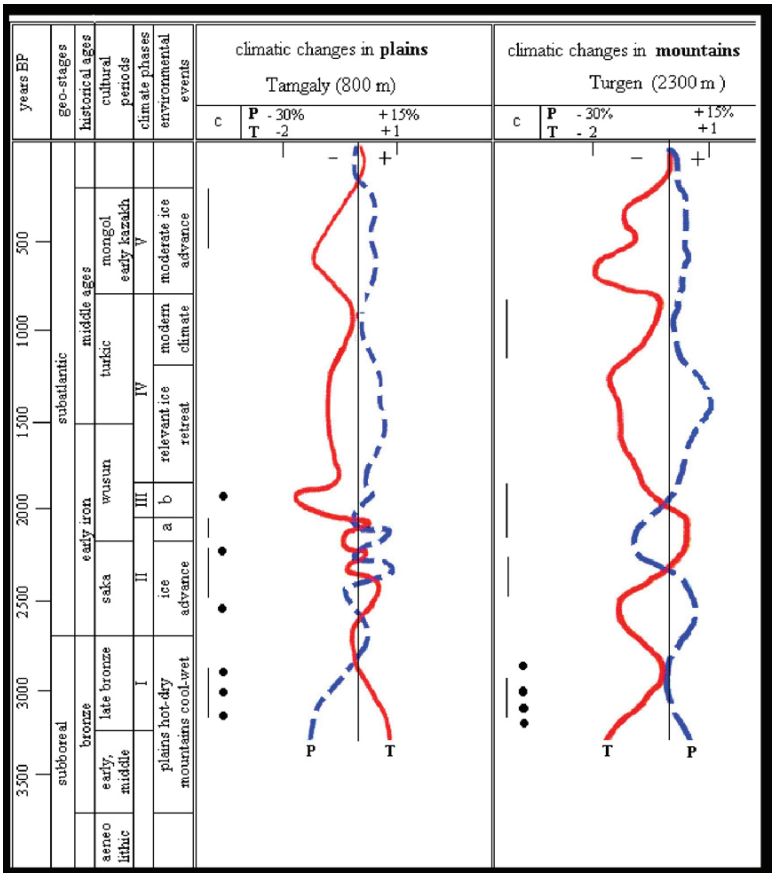

Fig.7 Climatic reconstruction in Semirechie

This major climatic change happened at the transition between the hot-dry late sub-Boreal (2nd millennium BC) and cold-wet early sub-Atlantic period (700-200 BC) (Fig.07). Natural resources were reduced in the mountains where meadows disappeared and increased in

the plains which were converted into steppes. This fact, among mix-farming shepherd communities, promoted new living strategies, mainly the switch of economic areas and the introduction of nomadic habits. Settlements changed localization, deserting the mountain meadows and populating piedmonts and plains; and, as a consequence of higher human mobility, saw the introduction of new types of dwellings: during the first phase (middle-late-final Bronze) entirely made of stones, clay and wood; during the second (Early Iron) made of light transportable elements and tents.

Therefore, these relevant climatic, environmental and cultural transformations of the turn of the 1st millennium BC allow us to distinguish, within the 2nd-1st millenniums, two phases of settlement location, respectively pertaining to the Bronze and Early Iron epochs.

2.3. Middle Ages

The Middle Ages in the Ili-Balkhash (early, middle, late) span from the second half of the 1st millennium AD (immigration of the Turkic confederations) to the 19th century (Kokand khanate occupation). The life was economically based on agricultural, commercial, and pastoralist practices and urbanization and politically on tribal chiefdom and primitive forms of statehood.

The Medieval monuments consist of large towns (walled towns and square forts-*tortkul*), villages, water devices and roads, cemeteries, ritual enclosures, mines and smelting workshops and landscape marks. The most significant among them are located at the mouth of mountain valleys or at the head of river deltas and irrigation schemes. The biggest Medieval sites of the region are: Kastek, Talgar, Chilik, Zharkent, Almalyk (in China), Dungene (Taldykorgan), Koilyk (Antonovka), Koktuma and 3 large forts at the South of the Lake Balkhash. (Fig.8)

Their location becomes independent from the natural location of raw materials and progressively

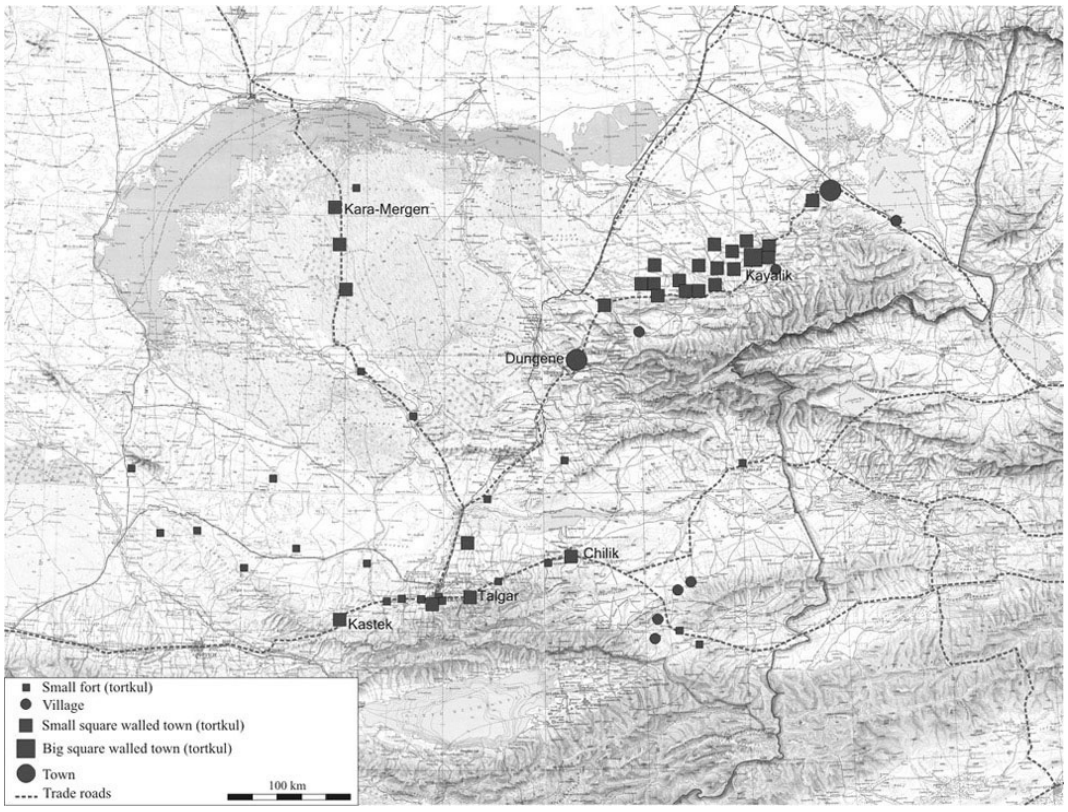

Fig.8 Map of the Medieval towns of the Ili-Balkhash basin

more independent from the natural location of water facilities, climate and relief features. In fact the medieval urban enterprise could ensure such conditions through other ways, like the use of large collective works and advanced technical expedients (transportation, canals, walls).

Instead, the main eco-economical feature of the geographical location of Medieval monuments, as an expression of large agricultural and commercial societies, is their *concentration in proximity to strategic economical opportunities: radially around irrigation schemes (Taldykurgan, Koilyk oases) and longitudinally along transport ways (Northern Silk Road)*.

The Kazakh (ethnographic) Late Medieval period shows the persistence of medieval location patterns.

2.4. Modern period

The advent of the Russian and Soviet periods has as its main characteristic the introduction of new advanced hydrological techniques (deep wells, artesian wells, long canals) which definitely freed the settlement location patterns from hydrological dependence, and favoured their larger concentration (Fig. 9). The new trend sees the displacement of all the pastoralist housings from inside valleys to large kolkhozes around piedmont wells, the concentration of a very large population in ancient towns and new ones located in piedmonts and plains, and the building of big mining centres in remote areas. From the geomorphological point of view, the new settlement patterns are definitely favouring large concentrations on wide flat areas of piedmonts and plains.

The *ecological factors of the geographical location of human monuments are not only the proximity of strategic economical opportunities like productive and commercial structures, but also clear political plans of administrative and territorial control.*

Fig.9 Map of Almaty Province Today

3. Conclusion

The historical development of the location of human settlements in the Ili-Balkhash region, when classified on the basis of ecological factors, happens across four successive periods that show the respective importance of different factors (in correspondence with four different economic bases): during the first period (Stone Age, non productive economy) the main factors are the provision of raw materials and water; during the second (Bronze and Early Iron, pastoralist economy) they are water, climate and relief; during the third (Middle ages, pastoralist-agricultural-commercial economy) agro-productive and commercial facilities; during the fourth (Modern period, agro-industrial-commercial economy) high hydrological technology, political control and mining activities.

Also topographical and geomorphological features dependent on climatic environmental changes constitute important aspects for further defining the secondary characteristics of monument location.

As a whole the historical changes of settlement location in the Ili-Balkhash basin show two general trends, persistent across climatic fluctuations:

- A *progressive independence* from natural factors thanks to growing human mobility, transport capability, technological capacities and market economy;
- A *progressive dependence* on socio-economical factors, i.e. the location of artificial constructions such as large productive plants and roads, and the administrative needs of societies integrated by politics, commerce and money.

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