

# An Archaeological GIS of the Surkhan Darya Province (Southern Uzbekistan)

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This article presents some of the results of a long-term project undertaken by the author within the framework of the MAFOuz de Bactriane.<sup>1</sup> It will be focused on the use of GIS for data organisation<sup>2</sup> and the potential that this offers for developing and testing new models and theories.

The Surkhan Darya province (20,800 km<sup>2</sup>) is situated in the south of Uzbekistan and borders Afghanistan, Turkmenistan and Tajikistan; most specialists consider that it forms part of the ancient region known as Bactria. In simplified terms, the province can be described as an alluvial

valley, limited by the Amu Darya river to the South and surrounded by mountains on all three other sides. The main mountain passes are the "Iron Gates," on the road to Samarkand, and the low foothills, which separate it from the Kafirnigan valley and Dushanbe to the north-east. The climate is continental with mild winters, little rainfall (just over 100 mm./year in the south, but more in the north) and a long summer drought. Agriculture therefore depends to a

large extent on artificial irrigation in the alluvial plain, although dry farming is practiced in the foothills. The mountains, especially to the north and west, provide excellent summer pastures and pastoralism has therefore probably always played an important role in the human ecology of the region.

For nearly 70 years, archaeological work was undertaken in the Surkhan Darya province exclusively by Soviet teams. They produced a wealth of quality data



Fig. 2. The upper Surkhan Darya plain with the Hissar Mountains in the background.

including over 2500 publications describing the excavations of sites such as Dzharkutan and Sapalli Tepe (Bronze Age), Kuchuk Tepe and Kyzyl Tepe (Iron Age), Dal'verzin Tepe, Khalchaian and Termez (Kushan period), Balalyk Tepe and Kujov Kurgan (early Middle Ages) or Budrach and Termez (Pre-Mongol period).<sup>3</sup> Foreign archaeological teams started working in the province in the early 1990's and since then seven foreign teams have undertaken excavations in collaboration with Uzbek teams (two Japanese, two French, one German, one Russian and one Czech) (Fig. 3). Archaeologically speaking, the Surkhan Darya province is thus one of the most thoroughly studied areas in Central Asia. It is therefore obvious that a systematic

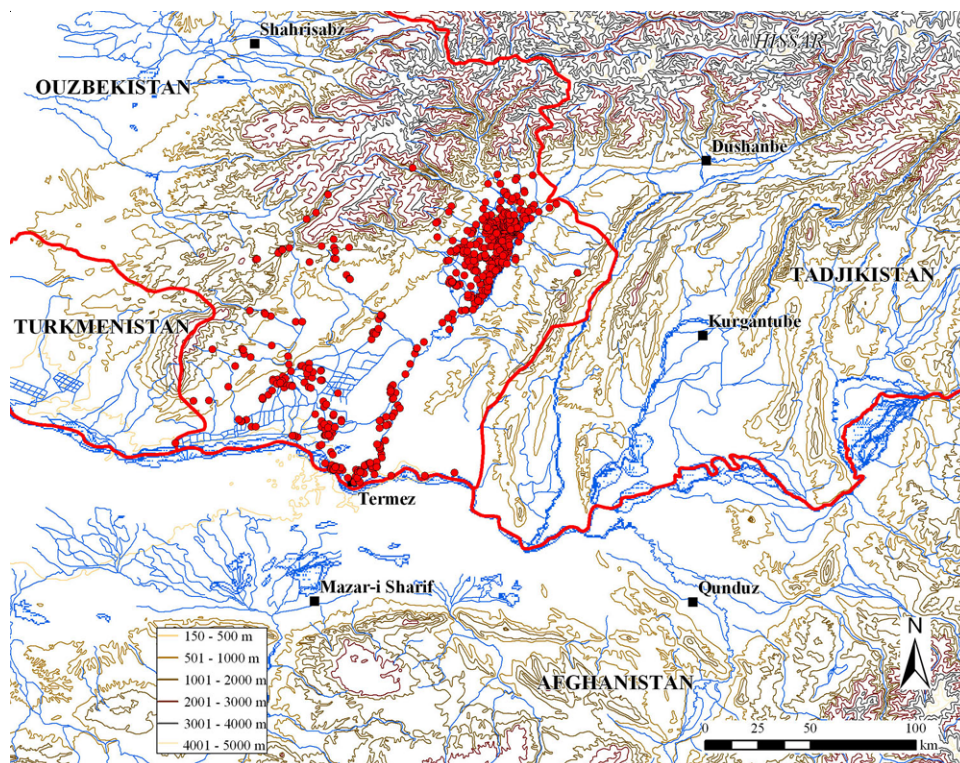


Fig. 1. A view of Bactria in GIS, with the archaeological sites of the Surkhan Darya province.





Fig.3. Archaeological work underway on the southeast angle of the citadel of Termez. The various fortifications visible in the photo are dated from the Kushan period up to the beginning of the 13th c. (photo: MAFOuz de Bactriane).

regional survey would be meaningless had the vast amount of data from the Soviet period not been taken into account.<sup>4</sup>

A large number of geographical studies of the area have also been undertaken, many of which are directly relevant to landscape archaeologists. This is particularly true of landscape studies, which, in the former Soviet Union, were considered to be important enough to form an autonomous discipline (*landshaftovedenie*). The most useful publication for the Surkhan Darya province is

that of Ergeshov 1974, which divides the province into fifty-six different land units, each of which is analyzed in detail by taking into account features such as the types of soil, vegetation, water availability, relief and climate in order to define potential human uses (Fig. 4).

Finally, a number of ethnographic studies of the area exist [e.g. Karmysheva 1976]. They include descriptions of the different types of exploitation of the landscape and of the interaction between ethnic groups. As such they provide useful material which can be compared to the geographical and archaeological data.

Any serious study of the Surkhan Darya requires this vast amount of data to be organized. I have alluded to the problems associated with data management, but it is useful to under-

line these problems with a few examples. Most archaeological sites documented during the Soviet period were not precisely localized (for example, the only data we have for Gurgak Tepe is that it is situated "1 km. to the south of the beautiful plane tree of the kolkhoz Zhdanov," according to Pugachenkova 1966, p.29; cf. Fig. 5), and in many cases, the same archaeological site is published



Fig. 5. The remains of a typical archaeological site in the Upper Surkhan Darya plain.

with different names and localizations in different articles. No complete bibliography of the province existed and most publications did not include an index. In addition to this, during the last five years, the results of new excavations have been published in various different journals and languages.

In a situation such as this, there is no miracle solution. Either you ignore the data, or you include only the most famous sites and a handful of major publications, or else, as in this case, you sort through the data systematically. A site gazetteer (based on Arshavskaya et al. 1982) was therefore developed in close collaboration with Uzbek scholars, and the 2500+ publications that concerned the area were systematically indexed.

The site database includes 680 sites, nearly all of which were localized in the field either using a GPS or by calculating the coordinates on 1:10,000 scale

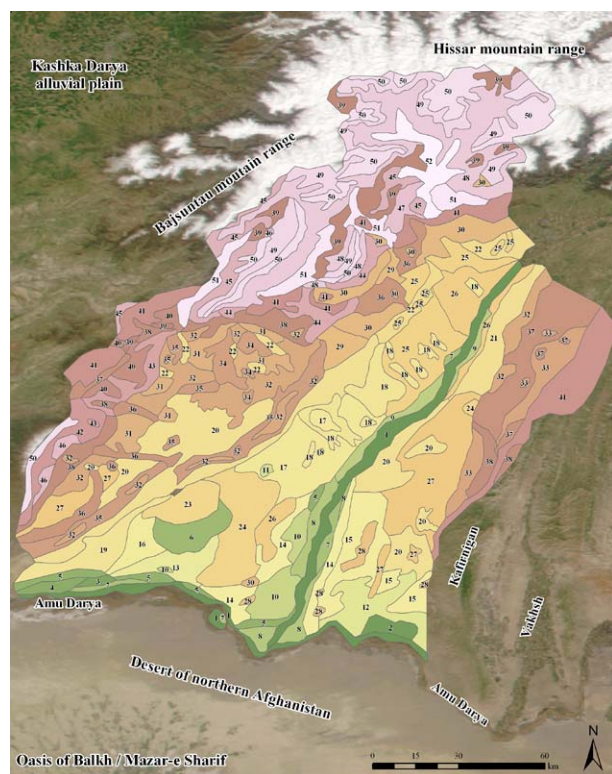


Fig. 4. The land units of the Surkhan Darya province according to Ergeshov 1974.

maps of the early 1950's (the precision of these maps is such that they include topographical anomalies less than 30 centimeters high and 5 meters across) [Fig. 6].<sup>5</sup> Ironically, localizing previously known sites proved much harder than finding new sites, since it was necessary to verify all the available data. Thus, in one case, the same site was visited three times with three different archaeologists each of whom had published the site under a different name without anyone realizing that it was the same site.

The bibliography includes all the publications concerning the archaeology of the Surkhan Darya province and a list of the archives of archaeological excavations. They are systematically indexed by site, by theme and by period, with commentary. For example, the bibliography of the Kushan period site of Dal'verzin Tepe includes over 350 references with

commentary, classified according to the area of excavation and/or the theme.

Once all these data were organized, the next logical step was to include them in a GIS, which contains not only all archaeological data but also:

- Scanned, georeferenced topographical maps, some of the most interesting of which are tsarist maps from the end of the 19th century (scale of about 1:50,000), German copies of Soviet maps of the 1930's (1:200,000) and Soviet topographical maps of the early 1950's (1:10,000).

- So far, vectorized data include VMap1 (based primarily on 1:250,000 scale maps) and "heads up" digitization of various features of the Upper Surkhan Darya plain based on the 1:10,000 scale maps.

- Geological, geomorphological and hydrological maps have been added, along with various tables of average temperatures, properties of the main water courses, etc. Finally each of the 56 land units defined by Ergeshov has been digitized and their descriptions systematized.

- The ethnic distribution maps pro-

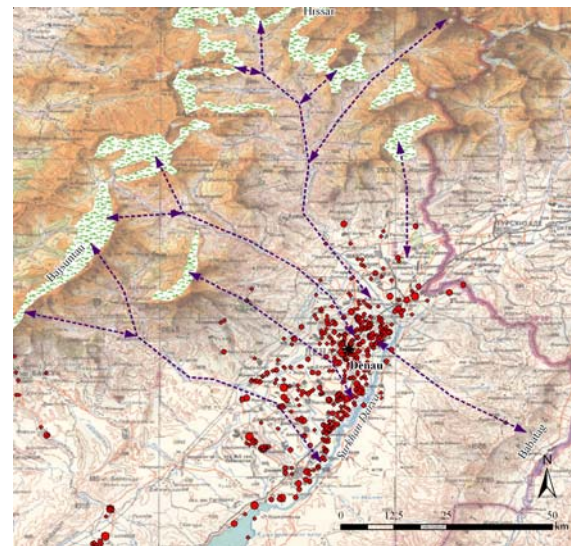


Fig. 7. Transhumant routes, pastures and archaeological sites in the northern half of the Surkhan Darya province.

duced by Karmysheva have also been vectorized; however the associated data are not yet included.

Apart from giving researchers direct access to geographical, ethnographical, archaeological and historical data, the GIS thus created can be used as a powerful analytical tool in its own right. For example, Fig. 7 shows the most productive pastures during the months of July and August, along with information on the main transhumant routes and the localization of the main archaeological sites in the Upper Surkhan Darya plain. The superposition of these different layers underlines the potential importance of transhumant pastoralism within the human ecology of the Upper Surkhan Darya plain and the bias of the archaeological record towards sites associated with irrigated agriculture.

Figs. 8a and 8b give a good idea of how the GIS can be used to combine data of variable quality. In Fig. 8a the underlying raster geomorphological map and the vectorized land unit types are based on data of poor cartographic quality; however the rest of the data is taken from

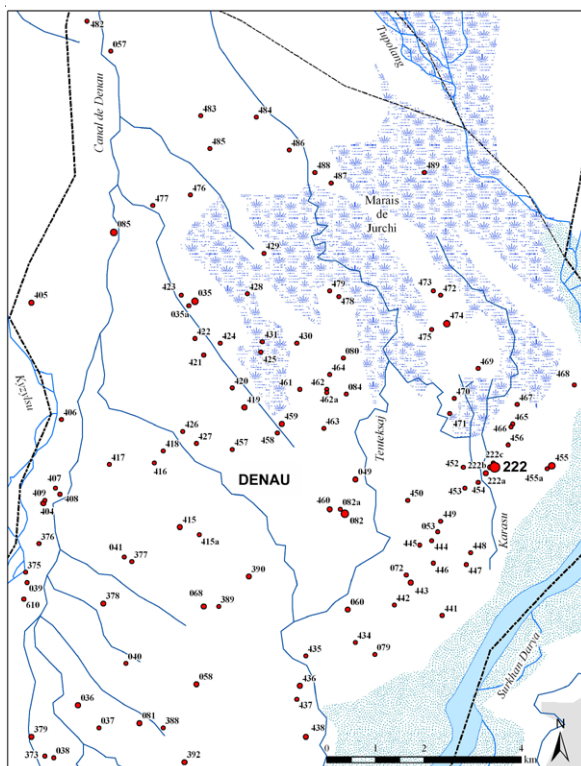


Fig. 6. Map of the archaeological sites around Denau, in the center of the Upper Surkhan Darya plain. No. 222 is Khalchaian.



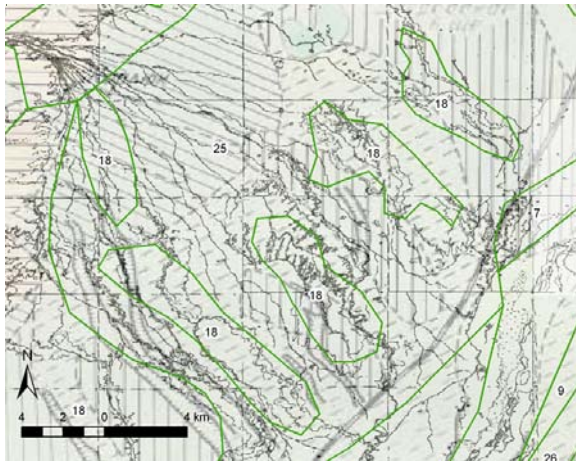


Fig. 8a. Part of the Khodzha Ipak alluvial cone showing a raster geomorphological map, land units vectorized from Ergeshov 1974 and water courses and the limits of terraces based on 1:10,000 scale maps.

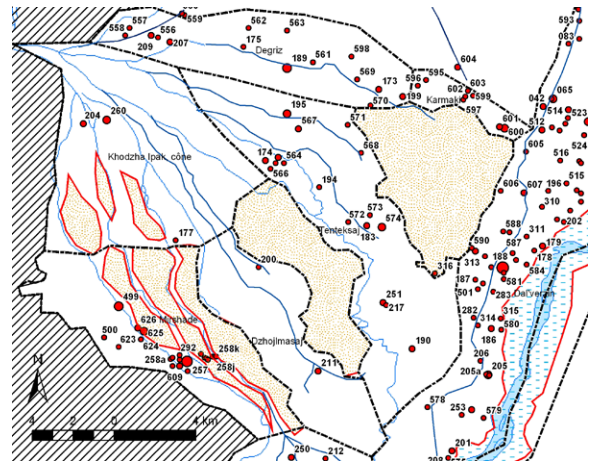


Fig. 8b. The same area, this time with redrawn land units, non-irrigable zones, floodplain, territories, water courses and archaeological sites.

1:10,000 scale maps. By combining the precision of these maps with the detailed descriptions made by Soviet geographers it is possible to create a new map, which can be used to define territories and calculate their potential for human use. The archaeological sites can thus be represented on a map that combines cartographic precision with the detailed geomorphological and landscape studies undertaken during the Soviet period (Fig. 8b).

Fig. 9 highlights the differences in settlement pattern between the Iron Age and the Kushan period. Whereas the Iron Age sites are concentrated along the small valleys of the peripheral zone of the alluvial cones, the Kushan period sites are centered on the Surkhan Darya alluvial plain around the two towns of Dal'verzín Tepe and Khalchajan.

In collaboration with scholars from the Institute of Archaeology in Samarkand, the GIS will now serve to integrate further databases. Three specific

projects are underway. One is to integrate databases of all the coins found during excavations in the province, the second to include published and unpublished plans of all the sites and excavations, and the third to digitalize data from the ongoing excavations of the sites of

Termez, Khajtabad and Payon Kurgan.

GIS is particularly interesting because it can evolve so easily, not only by adding new data but also by correcting mistakes, omissions and lacunae. This makes the process of elaborating hypothesis and testing them much more fluid, especially because the results can then be integrated back into the GIS. A medium-term goal of this project, in relation to the others described in this section is to create a series of interrelated databases, to which all scholars can contribute and have access. By doing this, it should then be possible to work towards a networking of the different Central Asian GIS projects.

The dream of a Central-Asia-wide archaeological database, which various scholars formulated long before GIS existed,<sup>6</sup> is in many respects now technically possible. The contemporary political divisions and the nature of archaeological research in the area (data manage-

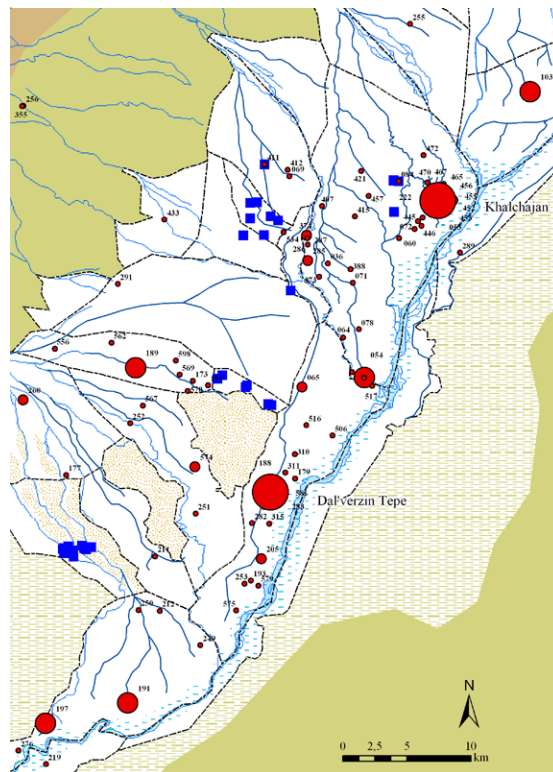


Fig. 9. Iron Age (square) and Kushan period (round) sites in the Upper Surkhan Darya plain.

ment problems, languages, etc.) make it especially necessary. Finally the fact that relatively few scholars are currently working in Central Asia may make it easier to reach a consensus on the form that such a network should take.

Obviously, this can only succeed if all archaeologists feel that their work is correctly attributed and that it is in their interest to integrate their data into a global system. This can be achieved by clearly indicating the author of the original work (and each of the authors responsible for cataloguing and digitizing it) and by networking projects in each of the institutions that collaborates, rather than centralizing the data in one single point.

It is planned to make the GIS of the Surkhan Darya available on the Internet in the near future. In the meantime, and in line with the concept of creating an open platform, specific data concerning a given site, period or theme of the Surkhan Darya province are available on request from the author.

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V. Trifonov and P. Dolukhanov. "Archaeological data in the USSR — collection, storage and exploitation: has IT a role?" In: *Archaeology and the Information Age*. One World Archaeology, No. 21. P. Reilly, S. Rahtz, eds. London: Routledge, 1992: 64-65.
- Ph.D. dissertation to be defended at the University of Paris I in January 2005. A valuable overview of the joint archaeological projects involving French teams in Central Asia may be found in *Cahiers d'Asie centrale*, No. 9 (2001): 236-302.
2. The problem of data management in the former Soviet republics of Central Asia can hardly be overstated. Back in the early 1990's, two of the foremost Russian archaeologists, Viktor Trifonov and Paul Dolukhanov, published an article in which they wrote that the lack of data management systems was making research in the Soviet Union extremely difficult:
- Data collection is a profession in itself and mere possession of information is seen as a major scientific achievement [...]. It is no surprise that foreign researchers are discouraged by the difficulties they encounter when trying to find their bearings in the maze of modern Soviet archaeology. The fact that some succeed is the real surprise. [Trifonov, and Dolukhanov 1992, p.65]
- The end of the Soviet system, the emergence of the newly independent republics and the appearance of foreign archaeological teams have increased the global awareness of Central Asian archaeology. However this has not made access to data any easier.
3. The best historical and archaeological overview of the Surkhan Darya province is Pugachenkova and Rtveladze 1990.
4. A systematic survey was necessary, not only because most known sites were not precisely localized, dated or associated with their environment but because much of the evidence, and in particular that of the small sites, had not been included.



5. The coordinates of some 50 sites were calculated using both methods with almost identical results. The Geographic Positioning System (GPS) ceased working in the Surkhan Darya province on the 8th of October 2001; it is now apparently working once again.

6. In the 1950's, a number of leading Soviet specialists planned to publish a Historical and Ethnographical Atlas of Central Asia, which would have included maps and catalogues of archaeological sites, ethnographical groups, specific objects, etc. [for example Litvinskii 1959]. Later Jean-Claude Gardin emphasized the need for an archaeological atlas [Gardin 1985] and laid a theoretical basis for this work in his many publications on information systems and the development of technical means of sharing data through information networks (envi-sioned in a time of punch marked cards!).

## Methods and Perspectives for Ancient Settlement Studies in the Middle Zeravshan Valley

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The "Archaeological Map of the Middle Zeravshan Valley" Project, begun in 2001 [Shirinov and Tosi 2003], is a cooperation between the Institute of Archaeology of Samarkand and the Department of Archaeology of the University of Bologna. It was created and evolves with two main aims: the study of the ancient population and settlement dynamics of the Middle Zeravshan Valley (Fig.1), and the recovery, preservation and enhancing of Samarkand and its territory. This brief description will be concerned with the first.

The area around Samarkand is characterized by the existence of three "mesopotamias" (locally known as *doab* "two waters" in Persian or *jazira* "island" in Arabic). These are formed by the splitting of the Zeravshan River after its exit from the Turkestan Mountains into the Karadarya and Akdarya branches, and the two main artificial canals, the Bulungur Canal to the north and the Dargom Canal to the south. Together these four parallel trunk collectors merge their alluvial sediments and form a stretch of

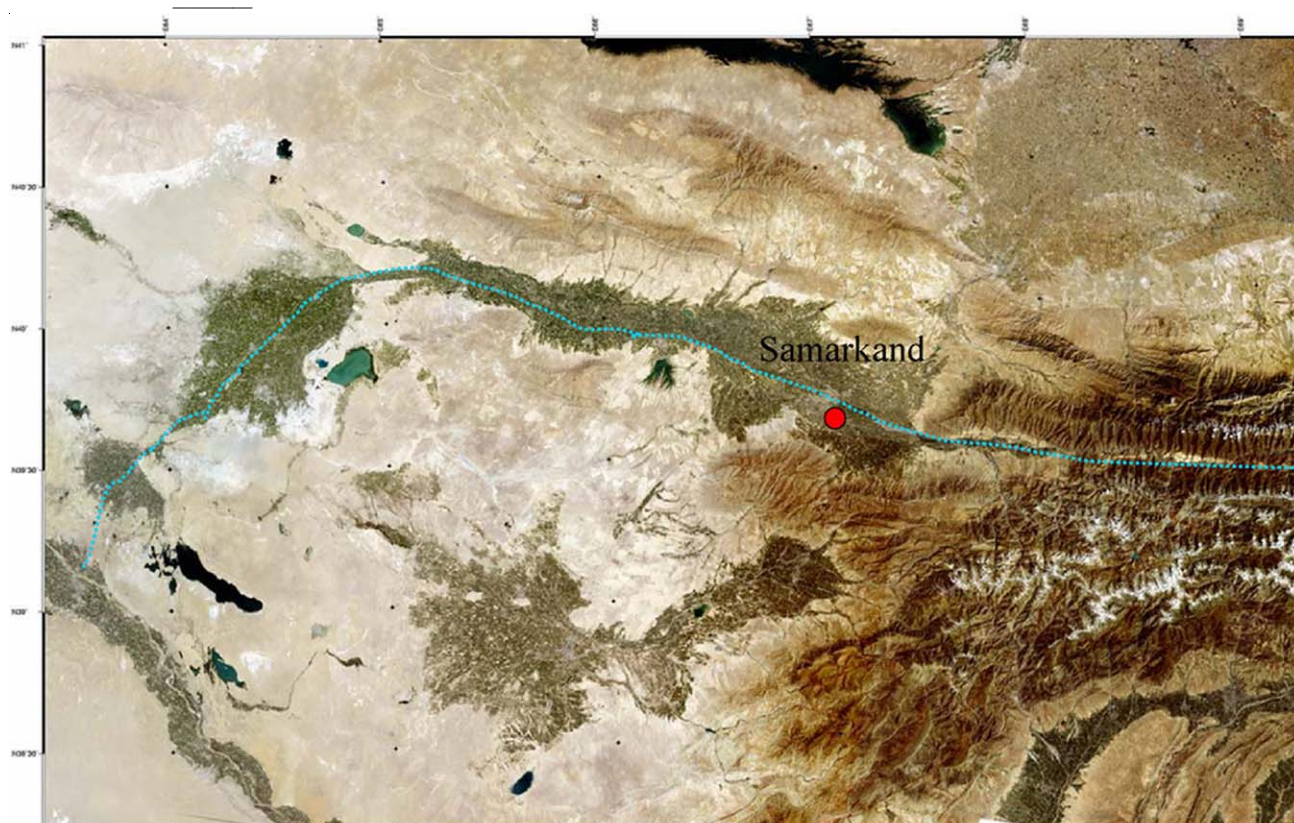


Fig. 1. The Zeravshan Valley from LANDSAT 5. The main irrigated area, corresponding to the oasis of Samarkand and Bukhara, is clearly visible.