Evolution of human settlements and natural risk factors. A case study of Chalcolithic archaeological sites in the Valea Oii watershed (Romania)

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Settlement takes into account the physical and geographical factors of a targeted area and dwellings are placed generally in the upper sectors of small watersheds. These represent the most uniform territorial entities from a geographic and strategic perspective. On a large scale, the situation is similar regarding the villages within large watersheds. The same principles have applied to settlement location throughout history (Postel *et al*. 1996: 785–788).

The Valea Oii watershed is where the largest settlement belonging to the Pre-Cucuteni culture in the territory of Romania has been discovered. The Pre-Cucuteni culture (c. 4200–3700 BC uncalibrated radiocarbon dates) played an important role in the genesis of the most representative Chalcolithic civilization of Europe, the Cucuteni–Tripolie. In the course of three evolution stages, the Pre-Cucuteni communities spread between Transylvania, the Bug–Dnieper interfluve, the upper streams of the Pruth, the Dniester, and northwest of the Black Sea. Thus was formed a core area from which the Cucuteni–Ariusd–Tripolie cultural complex later emerged (Boghian 2001: 79–85; Nandris 1987: 201–222).

Based on new interdisciplinary research, this study attempts to delimit, for the first time in Romania, areas suitable for settlement within a watershed, depending on the natural and socio-political circumstances. The main historical periods, from the Chalcolithic to the present, are considered from this perspective. The focus is on the connection between the location of human settlement and the dynamics of natural risk factors, which include floods, landslides, gully erosion and fluvial erosion. The Valea Oii watershed is situated in the northeast of Romania and it covers, for the most part, the Moldavian Plain, except for a small part of the upper basin situated in the Suceava Plateau (Fig. 1).

Archaeological sites/settlements were mapped with a GPS Leica 1200 System. The data were georeferenced and processed in STEREO 70 coordinates. Old maps were georeferenced through the correspondence method (finding the same topographical marks, oldest and newest, on both maps); the final maps were obtained with the help of AutoCAD, TNTmips and ArcMap 9.3 software. CorelDRAW was used for graphic processing. To determine lake basin evolution, topographical maps and plans were used and the lake limits extracted. The following cartographic materials were used: topographical maps scale 1:50000 (edition 1894), shooting plans scale 1:20000 (1957–1958), topographical

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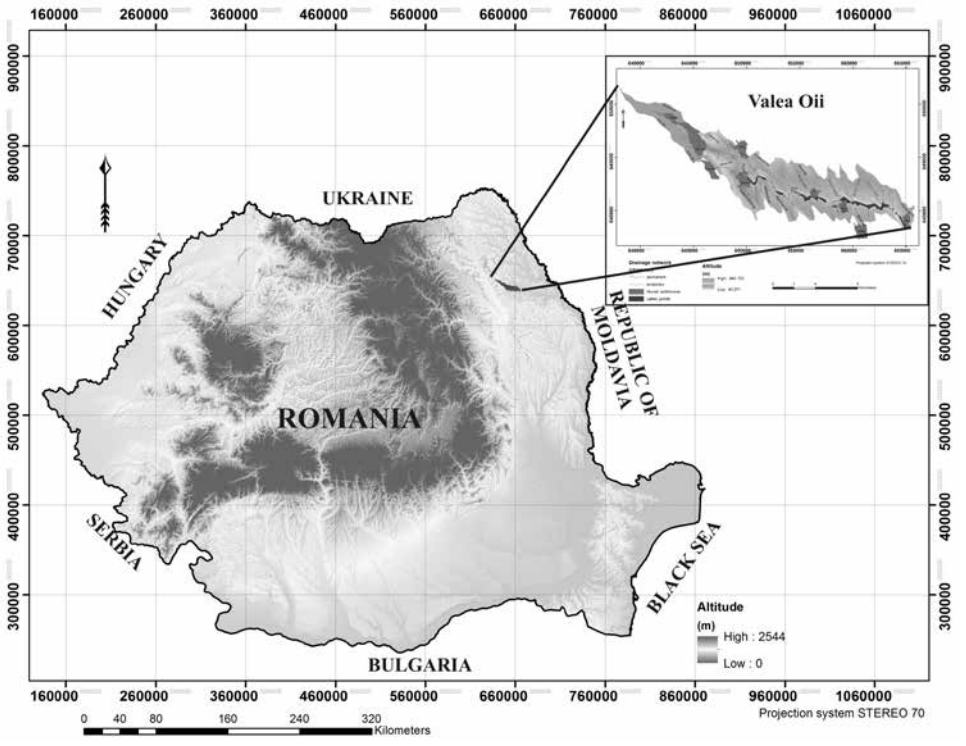

Fig. 1. Geographic location of the Valea Oii watershed in Romanian territory

plans scale 1:5000 (1982), and orthophotoplans scale 1:5000 (2005). Austrian topographical maps scale 1:200000 (1910) and Soviet topographical maps scale 1:200000 (1942) were excluded from the study, because most of the lakes were too small to be represented in this scale. At the same time, data from the Water Cadastre Atlas and the Prut–Barlad Water Headquarters in Iasi were consulted.

The Valea Oii watershed represents an old habitation area, still inhabited today, the settlement there dating back to the Chalcolithic. Traces of the Cucuteni–Tripolie culture, going back about 4,000 years, were discovered inside this basin (Fig. 2). The high density of archaeological sites should be emphasized, mostly in the upstream sector of the basin, at the junction of the higher area (plateau) and the lower zone (plain) (Romanescu and Nicu 2014: 509–523).

Chalcolithic settlements in the upper sector of the basin created the conditions for the spread of the population to the lower basin. The migration process was caused by hydrological and geomorphological hazards, such as catastrophic floods, landslides and gully erosion (Romanescu *et al.* 2012: 953–966). These were the result of deforestation that was the result in turn of extending cultivated land, which led to strong soil erosion processes creating non-productive soils (anthrosols, protosols). In this situation, settlement shifted its focus to the lower-lying areas, which were exposed to floods, but which had more water resources and agriculturally more productive soils. The migration coincided with progress in "land management" knowledge and the growing

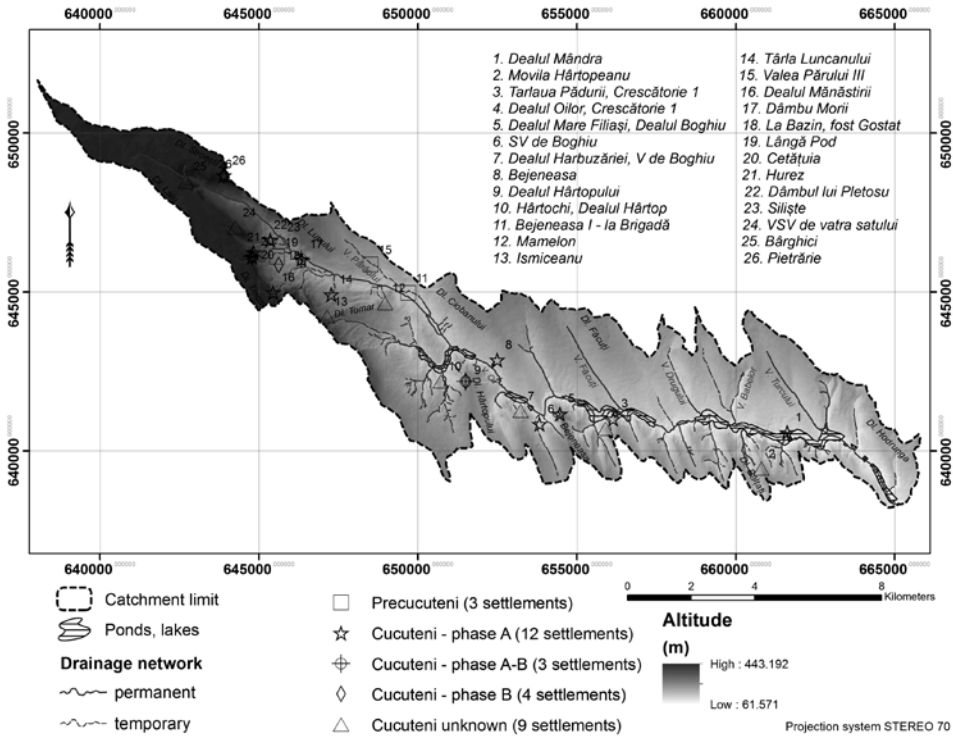

Fig. 2. Location of the Chalcolithic settlements in the Valea Oii watershed

pressures of natural hazards. Dwellings were now placed on the floodplain or the never flooded primary terraces, close to the river mainstream. Water conditions all human settlement (Fig. 3), hence limited water resources force the construction of ponds. The current large size of the aquatic surface of the basin indicates reduced water resources, explaining why all settlement in the lower basin, whether ancient or modern, is concentrated along the Valea Oii River.

New territories in the Valea Oii were occupied because of intensified natural hazards, such as floods, landslides and gully erosion, occurring in the upper sectors of the basin sectors. Deforestation and superficial erosion reduced the food resources, while the floodplain, continuously supplied with recent alluvia, gave rise to highly profitable agriculture, providing food for a larger number of individuals. This was why settlement extended to the lower sector of the Valea Oii watershed.

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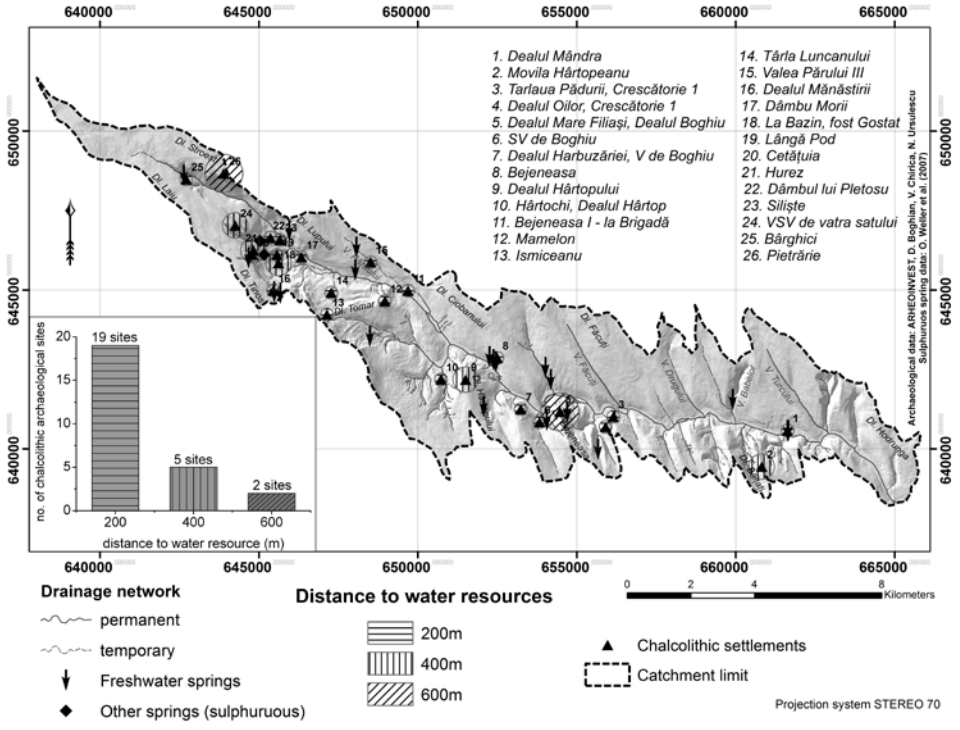

Fig. 3. Location of archaeological sites depending on water resources

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