

*Žilje u znak pozdruga*  
*Čutor*

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GEOMORPHOLOGICAL AND HYDROGEOLOGICAL  
CHARACTERISTICS AND THE POSSIBILITIES OF THE  
UTILIZATION OF WATERS IN THE WABI SHEBELLI  
CATCHMENT AREA, ETHIOPIA

*S 1 sl. u tekstu*

Geomorphologically, the whole catchment area has been divided into four geomorphological units, as follows: the southeastern part of the Ethiopian Plateau, the transition steppe zone between the Ethiopian and the Somalian Plateaus, the Plain of Ogaden, and the Wabi Shebelli Valley from Imi to the Somalian border.

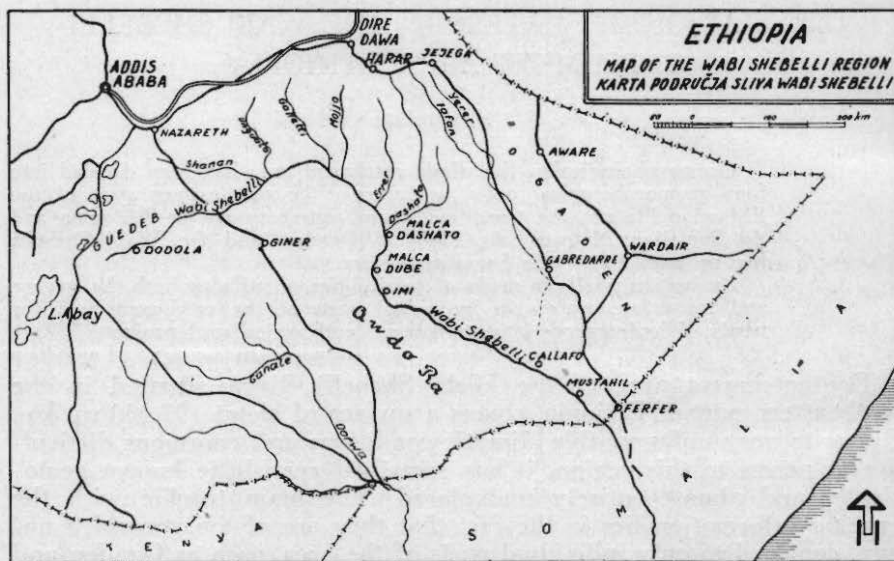
Evaluation has been made of possibilities of utilizing both the surface and subsurface waters in individual parts of the catchment area for needs of hydroenergetic, watercontrol, and agricultural projects.

The catchment area of the Wabi Shebelli River, situated in the southeastern part of Ethiopia, covers a surface of about 197,000 sq. km. Owing to very unfavourable climatic conditions and enormous difficulties of access to this region, it has remained very little known geologically and almost entirely unexplored. The main trouble with the existing information lies in the fact that they are of too general a nature, confined to only individual parts of the area, such as Ogaden and the uppermost part of the Wabi Shebelli drainage basin. The earliest geological data were supplied by W. T. Blanford (1869, 1870) and E. Krenkel (1925, 1926); they were further found in the works by C. I. Migliorini (1937-39, 1948) and G. Dainelli (1943), who also prepared a geological map of the northeastern part of Africa.

More recent and more complete reports on the Ogaden area were published by W. O. Clift (1956), who, in addition to lithological and paleontological data, also included a survey of regional geological events having taken place in the area of the East-African »horn«. These and other data, supplemented by the author's field observations, have served as the basis for geomorphological and hydrogeological studies of the Wabi Shebelli catchment area, which may be used as a starting point for regional hydrogeological investigations.

Geomorphologically, the catchment area has been divided into four units.

At the northeastern edge of the catchment area there is a range of mountains reaching up to 4,000 m. It makes a part of the mountain massif of the southeastern part of the Ethiopian Plateau and is characterized by a highly diversified and steep relief. The higher parts of the massif are composed of extrusive rocks which, shaped as blankets and patches, overlie Mesozoic sedimentary rocks. The origin and development is closely related to tectonic and volcanic activities that took place in the Rift Valley area.



The second geomorphological unit is represented by a transient step zone between the mountain range of the southeastern edge of the Ethiopian Plateau and the Somalian Plateau. This is a lower step of a slightly undulated plateau, gently sloping toward the southeast. The greater part of the area is made up of Mesozoic sediments. It is intersected by a number of water courses and deeply eroded canyon-like valleys.

The third geomorphological unit is the low, slightly rolling Ogaden Plain, making the part of the Somalian Plateau. The average heights are in the range between 400–500 m. The district is characterized by a poorly developed surface hydrographical network. The soil, exhibiting a semi-desert character, is chiefly composed of sand and laterite.

A separate geomorphological unit is the part of the Wabi Shebelli Valley from Imi up to the Somalian border. The length of this part of the valley is estimated to be 450 km, the width ranging from 6–60 km, the average being between 10–15 km. Both the origin and later development of the valley may be explained by tectonic activities. The valley is filled with Quaternary deposits from which small hills and hillocks of carbonate rocks protrude into the wider area of Callafo.

Because of an inadequate knowledge of the terrain's structural composition, it is difficult to discuss the hydrogeological relations without resorting to theoretical speculations and general statements incompatible with the character and purpose of this article.

Generally, it may be said that the movement of subsurface waters is directed toward the river's valleys, particularly toward the part of the valley of the middle course of the Wabi Shebelli River. Quantities of subsurface waters are certainly limited and are practically found in the area of Ogaden and the Wabi Shebelli Valley from Imi up to the Somalian border, and also in the valleys of some of its tributaries. In the Ogaden area water occurs at a greater depth, its exploitation being made possible by means of deep wells. In the valleys of the water course can be reached through shallow and economical wells.

As for water quantities on the terrain's surface, they may be deemed as rather small in regard to the extent of the catchment area. Considering the significance of water in these regions, as well as the character and regime prevailing in the catchment area, it may be stated that there are great possibilities of the use of water for both hydroelectric and water supply projects as well as for irrigation purposes. A complete yearly balancing of waters by means of building storage basins would make it possible to produce great amounts of energy, ensure large water quantities for irrigation and water supply requirements, as well as for flood controlling projects. With this in view, the Wabi Shebelli catchment area and its water course may be divided into four parts considerably differing both in hydrological and hydraulic properties. The uppermost part of the area is relatively rich in rainfall, with the river course carrying considerable quantities of water. In the Guedeb Valley there are two waterfalls with about 80 m. of utilizable water head, below which the river canyon continues to run at a rather great gradient over a distance of about 50 km. At this point it could be possible to erect a large storage basin by which the downstream regime of water balancing would be controlled. The second part of the Wabi Shebelli water course up to Malca Dashato, exhibiting canyon character and being of somewhat smaller gradient, has large water quantities, received from a certain number of left tributaries. At this section the building of storage basins would also be feasible, for instance, at the mouth of the tributaries Gallatti and Mojjo. The third part is represented by the interval from Malca Dashato up to Imi, where ca-

nyon character ceases to be present. Here, too, the construction of a storage would be possible, which would supply water for irrigation of The valley downstream of Imi. The last portion of the course is of lowland character. The river's gradient is very small. The water course, making its way in thick Quaternary deposits, exhibits a tendency to change the course direction and meandering. Biannually, as a rule, the river floods vast land surfaces in the valley, but usually retires to its bed after several days.

There are certain possibilities of building minor storage basins on the tributaries of the Wabi Shebelli, for both an economical production of electric energy and water supplying projects. More significant among the valley downstream of Imi. The last portion of the course is of which are permanent water courses, the others having only a periodic character.

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#### OPĆE GEOMORFOLOŠKE I HIDROGEOLOŠKE KARAKTERISTIKE I MOGUĆNOSTI KORIŠTENJA VODA U PODRUČJU SLIVA RIJEKE WABI SHEBELLI (ETIOPIJA)

Područje sliva rijeke Wabi Shebelli smješteno je u jugoistočnom dijelu Etiopije i zauzima oko 197.000 km<sup>2</sup>. Zbog teških klimatskih uvjeta i izvanredno teške pristupačnosti u ovo područje, ono je ostalo geološki vrlo slabo poznato i skoro potpuno neistraženo. Glavni nedostatak postojećih podataka leži u tome, što su previše općeniti

i fragmentarnog karaktera, a uglavnom su ograničeni na područje Ogadena i najgor-nji dio sliva Wabi Shebelli. Posebno treba istaći dva autora i to G. Dainellia (1943), koji je izradio manuskriptnu kartu područja sjeveroistočne Afrike, i W. O. Clifta (1956), koji je za područje Ogadena objavio potpunije podatke u obliku jedne zaokružene geološke cjeline.

Podaci spomenutih autora poslužili su kao osnova za razmatranje geomorfologije i hidrogeologije u području sliva Wabi Shebelli, koji u geomorfološkom i hidrogeološkom pogledu predstavlja prirodnu cjelinu.

U geomorfološkom pogledu područje sliva je podijeljeno na 4 geomorfološke jedinice i to: jugoistočni dio Etiopske visoravni, prelazna stepska zona između Etiopske visoravni i Somalijskog platoa, zaravan Ogadena, te dolina Wabi Shebelli od Imi-a do somalijske granice.

U hidrogeološkom dijelu prikaza dane su opće ocjene mogućnosti korištenja podzemnih i površinskih voda u pojedinim dijelovima sliva za potrebe hidroenergetike, vodosnabdjevanja i poljoprivrede.

Imajući u vidu još potpuno neizgrađeni privredni karakter ovog područja, kao i perspektivne potrebe daljnjih istraživanja, autor smatra da ovaj prikaz može korisno poslužiti kao polazna tačka za regionalna hidrogeološka i druga istraživanja tog područja.

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