

THE EFFECT OF THE WATER PRODUCTION IN THE AREA BETWEEN THE RIVERS DANUBE AND TISZA

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Abstract: In the first half of the last century the deeper Pleistocene aquifers were in original condition. In the second half of the last century the water demand has increased and a lot of wells were drilled in this region. The water production had grown up from the sixties. In the last decades the depression spread in all the area. From the early nineties the water production has decreased and the pressure in the main aquifer has changed.

Keywords: aquifer, water production, water level, observation, depression, map

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Kurzfassung: In der ersten Hälfte des 20.Jh. befanden sich die tieferen wasserführenden Pleistozänschichten noch im ursprünglichen Zustande. In der zweiten Hälfte des Jahrhunderts hat in dieser Region der Wasserbedarf zugenommen und viele neue Brunnen wurden geteuft. Die Wasserförderung stieg von den 1960er Jahren rasch an. In den letzten Jahrzehnten hat sich die Depression im ganzen Gebiet ausgebreitet. Ab 1990 hat die Wasserförderung wieder abgenommen und die Druckverhältnisse des Hauptaquifers haben sich verändert.

Schlüsselwörter: Aquifer, Wasserförderung, Wasserniveau, Beobachtung, Depression, Karte

1. Introduction

The area between the Rivers Danube and Tisza is in the west part of the Great Hungarian Plain. The size of the region is about 12.000 km². The borders on the west and east are the two big rivers, on the north are the hills of Gödöllő, and on the south is the border of the country (Figure 1). This part of Hungary is an agricultural and horticultural area with big cities and villages. There is a big national park in the centre of the area. On the west, and east part of the area are two big river valleys. The centre part is higher than the valleys and the surface is covered by sand, running sand.

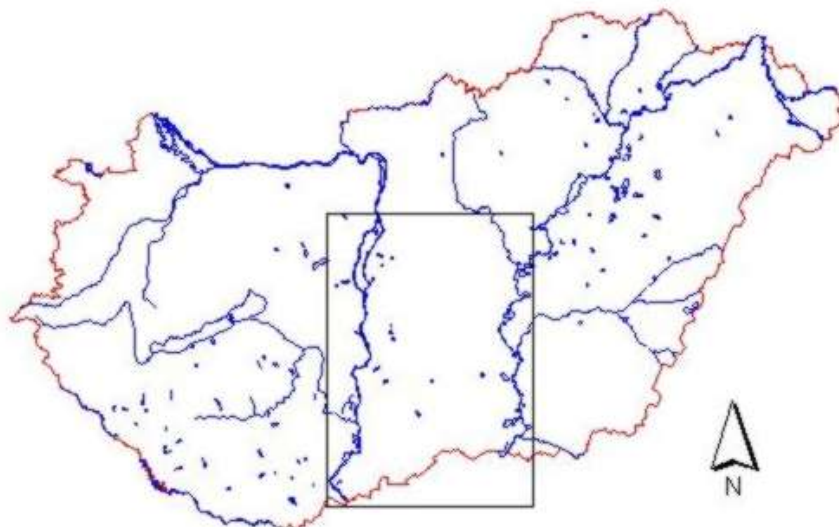


Figure 1. The area between the rivers Danube and Tisza

In the first half of the last century the water demand of the population, and the industry and the agriculture were supplied from the rivers, canals, lakes, and dug wells. From the fifties the water demand has increased and the dug wells and canals were not able to satisfy it. The growing of water consumption needed for research of the deeper aquifers. The main aquifer is Pleistocene sand, pebble in this area. The thickness of this aquifer is less than 50 m on the west part (Danube valley). In the centre of the Plain the thickness of the Pleistocene aquifer is 7-800 m (Tisza valley). On the surface, above the pleistocene layers is a thin holocen soil, in all the area. Under the pleistocene are the upper pannonian (pliocene) layers (clay, fine sand) with thermal waters. From the fifties of the last century a great number of wells were drilled for water supply. Because of the high water temperature, the wells are not deeper than 400 m – for drinking water supply. The water quality is good. The average depth of the filtered zone of this aquifer is illustrated on the map (Figure 2).

The research of the effect of the water production began in the sixties and early seventies. Dr. M. Erdélyi was the first, who examined the problem. He collected data of the first wells, which were drilled earlier and he and his colleagues measured wells in this area. From these data a piezometric contour map was constructed, which illustrated the original condition of the main aquifer (Figure 3). According to his research were drilled the first observation wells at Kecskemét and Szeged waterworks. It was the beginning of the observation network in the Great Hungarian Plain.

2. Research in 2000-2002

The water production had grown up from the end of the sixties till the early nineties. The greatest water production was at the end of eighties. The depression reached 10-15 m in the main aquifers around the waterworks and spread over in all the area. The greatest cities in the area are Kecskemét and Szeged. The water production of their waterworks is characteristic in the Danube-Tisza area. The observation well (N°790) is at Kecskemét. The filter of this well is 218-263 m under the surface. The change of the time series of this well is the same as in the other observation wells in the area (Figure 4). Far from the centre of waterworks the depression was smaller, sometimes only a few decimetres. The conditions changed in the early nineties. Because of changes of economy the water demand decreased. The water production and the depression in the aquifers decreased.

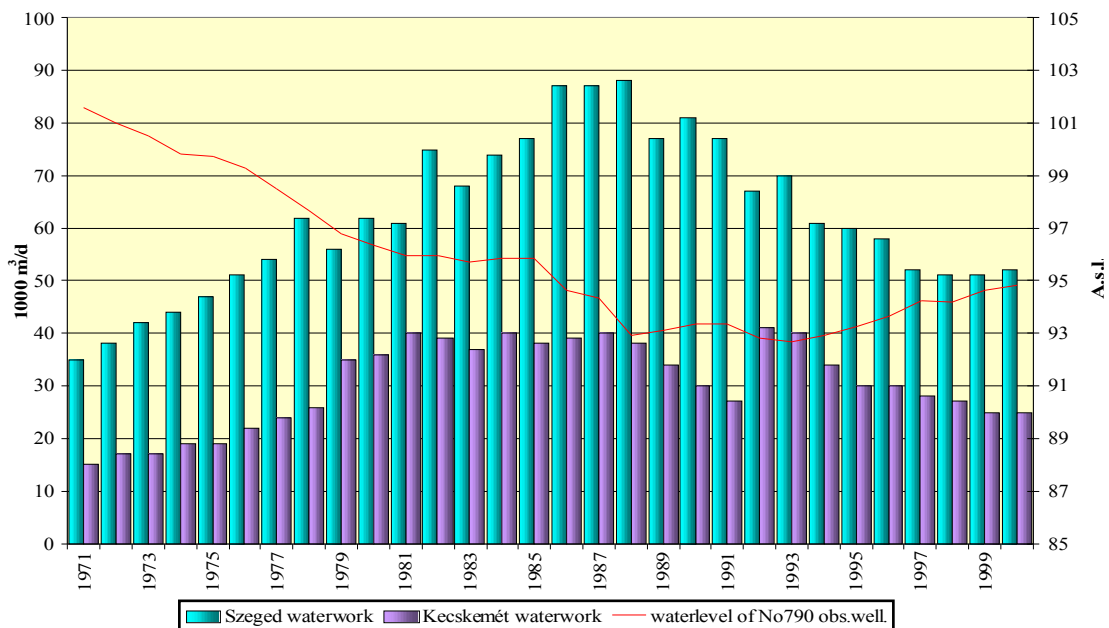


Figure 4. The water production of waterworks and the time series of an observation well

We examined the effect of the change of the water production in the main aquifer. The static water levels increased (Figure 5). The piezometric contours are represented on this map. From the first research, observation wells have been drilled in this area. In the last 30 years a lot of wells have been drilled for water supply and the Water Authority collected data of these wells. We used data of observation and water wells and we measured static water levels in a few wells.

The static water level was higher than the surface in a lot of wells around Szeged in the sixties and early seventies. Because of the growing of the water production the water level in the observation wells sank under the surface. In the second half of the nineties the water levels is higher than the surface at Szeged, but lower than in the seventies (Figure 4). The phenomena is the same in the region.

3. References

Dr. M. Erdélyi (1972): Investigations of the ground-water movement using indirect methods shown on the example of the Hungarian Basin.

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