

Promotion of Emergency Use of Groundwater at Disaster

--- Evaluation of the available volume of groundwater with hydrological cycle analysis ---

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1. Introduction

Groundwater is one of the important factors that constitute the hydrological cycle system and has been one of the important water resources in Japan's history since good groundwater can often be obtained close to home.

However, excessive intake of groundwater in the rapid economic growth etc. had caused various groundwater problems, including fall of ground water level, intake trouble, ground subsidence, and saltwater intrusion into groundwater in seaside area. Accordingly, intake of groundwater had been regulated and conversion of water source from groundwater to surface water had been conducted centering on the areas where groundwater problems occurred. As a result, the tendency of recovery in groundwater level has been confirmed and groundwater is used effectively in some communities, but it is necessary to use groundwater carefully in order not to repeat the past failures.

On the other hand, the environment surrounding "water" has also been changing in Japan. For example, there is reportedly no room to suspect global warming, rainfall is becoming extreme, and increase in the risk of flood / drought is concerned. There is also a concern about water failure when the water supply system is hit by earthquake since occurrence of a large-scale earthquake, such as Nankai Trough Earthquake, is forecast at a high probability. It is also still fresh in our memory that water supply system was cut off and water supply activities were conducted in wide area in the July 2018 Heavy Rain and the 2018 Hokkaido Eastern Iburu Earthquake.

2. Evaluation of the available volume of groundwater with hydrological cycle analysis

Use of groundwater in the event of a disaster instead of surface water is expected to strengthen the resistance against disasters. To this end, available volume of groundwater needs to be evaluated in advance, and a case study was conducted in this study for the basin of Sendai River in Tottori Prefecture. Specifically, a hydrological cycle analysis model was built at the same basin to analyze a case of water source change to groundwater (diluvium) by 20% of the intake of surface water in terms of the drought event (shrinkage of the rainfall from April to August

in the 1994 rainfall waves to 1/100 of the year probability). In this analysis, comparison of analysis values was made with the minimum groundwater levels in the past and the groundwater level when ground subsidence became moderate and the possibility of emergency use of groundwater at a drought was found.

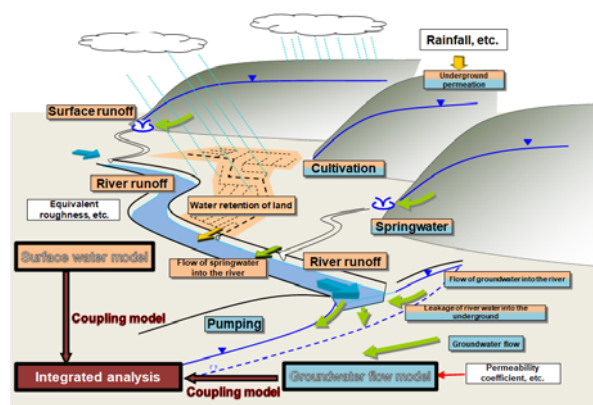


Fig.: Conceptual diagram of hydrological cycle analysis model

3. Cooperation well system at a disaster

The 1995 Hanshin / Awaji Great Earthquake caused damage to waterworks facilities and "water" ran short in many scenes, including firewater, drinking water for evacuees, and domestic water, and attention was paid to use of groundwater. In the 2007 Niigataken Chuetsu-oki Earthquake, water failure continued for about three weeks but serious water shortage did not occur because groundwater from wells normally used as a snow melting well was used.

In consideration of such examples, some local governments established "Disaster Cooperation Well" System, in which wells owned by citizens etc. are registered as "disaster cooperation well" so that groundwater is provided to local communities at disasters from a great earthquake etc.

Since evaluation of the available volume of groundwater with hydrological cycle analysis supports this system, we intend to continue the study including alternative use at disasters.

[Reference]

☞ See the following for details.

1) Technical Note of NILIM, No.883 (March 2016)
<http://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0883.htm>