

# Research Trends and Results

## For Establishment of Groundwater Management Contributing to Sound Hydrological Cycle --- Utilization of Hydrological Cycle Analysis for Groundwater Management ---

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### 1. Introduction

The Basic Law on the Water Cycle was established and enforced in fiscal 2014. This Law focuses on the public nature of water, providing that "Since water is a valuable common asset of the nation and a highly public resource, it shall be used properly and it shall be ensured that all the people can enjoy the benefits of water."

Conventional groundwater management in Japan has been developed in a limited way due to the restriction arising from its nature as private right related to land, centering on areas where public use of underground water, such as tap water, has advanced or areas where the ground remarkably subsided in the past. In the future, it is necessary to manage ground water in accordance with the purpose of the Basic Law on the Water Cycle and actual conditions of local areas. Aiming for contribution to this end, the Water Cycle Division of the National Institute for Land and Infrastructure Management (NILIM) is studying about hydrological cycle analysis.

### 2. Utilization of hydrological cycle analysis for groundwater management

Hydrological cycle analysis is a technique that couples hydrologic processes such as surface water and ground water to analyze them physically and integrally in terms of wide-area hydrological cycle systems, such as whole or part of basin, and is expected to be utilized widely for groundwater management.

In the first place, it is expected to grasp "basic information," such as flow characteristics of ground water and water balance in the basin, by interpolating discrete observation information. In order to promote management of ground water, consensus building among local residents and adjustment with the organizations concerned are essential, and as the first step for that purpose, it would be necessary to clarify and share such "basic information." In addition, grasp of flow characteristics can serve to examine observation wells for new construction and establishment of standards for appropriate water level, etc.

Further, it is possible to convert the information into "visual information" as shown in the streamline chart of Figure 1 using a plotting program. This will serve to foster the recognition that ground water is not indigenous to the land but one of the elements constituting a water cycle. Moreover, it is possible to use as a tool to "evaluate

policies," such as groundwater increment policies for paddy field cultivation or rain water infiltration, control of groundwater pumping. These information is expected to serve as important information in determining propriety of a policy or gaining understanding of a policy.

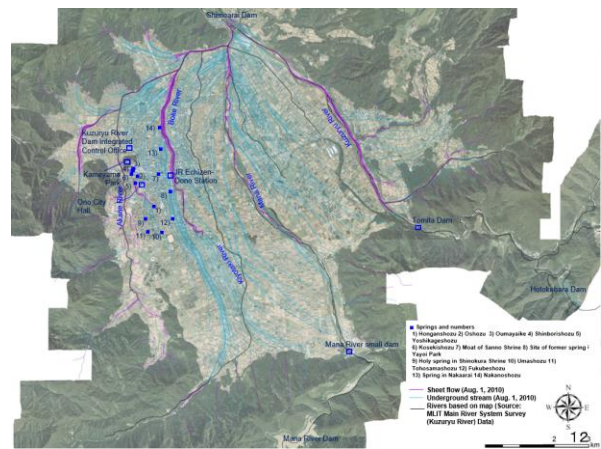


Figure 1. Streamline Chart in Oono Basin, Fukui

### 3. Trend of research

The Water Cycle Division of the NILIM has been conducting case studies on hydrological cycle analysis in the basin of Sendai River (alluvial plain in Tottori) and Oono Basin (alluvial fan in Fukui). Particularly in the Oono Basin, while collecting opinions from Oono City about specific needs for findings from the analysis, we are discussing effective position of paddy field cultivation and analyzing various cases in order to clarify the hydrogeological characteristics of the Oono Basin, including sensitivity analysis under various topographical / geological conditions.<sup>1)</sup>

We plan to document the know-how obtained through these studies as a manual or otherwise for local governments and expect it to contribute to further utilization of hydrological cycle analysis for groundwater management.

[Reference]

1) Journal "Rivers", August 2014 issue "Utilization of Hydrological Cycle Analysis for Maintenance / Improvement of Sound Hydrological Cycle"