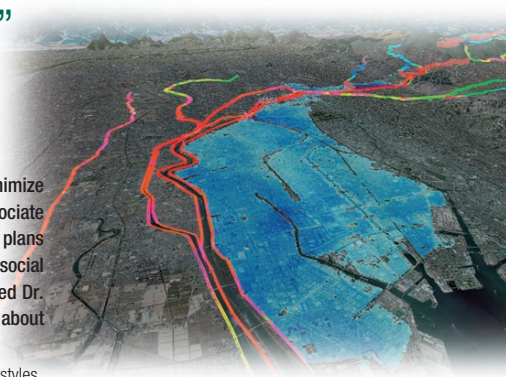


## Utilizing the Real-Time Flood Simulator “DioVISTA/Flood” in Research on Measures Against Frequently Occurring Inundation of Rivers



Every year in Japan, flood disasters occur due to torrential rains and typhoons caused by climate change. “We would like to minimize the flood disasters caused by inundation and avoid the loss of human lives in any type of flood.” With this in mind, Dr. Taki, Associate Professor in the School of Environmental Sciences at the University of Shiga Prefecture, is conducting research on policies and plans to realize a sustainable river basin society\*, focusing on the mutual relationship between water circulation in the river basin and social systems. Hitachi Power Solutions’ Real-Time Flood Simulator “DioVISTA/Flood” plays a key role in this research. We interviewed Dr. Taki, along with Dr. Yamaguchi of the Research & Development Group at Hitachi, Ltd. who is the developer of DioVISTA/Flood, about the possibilities of measures for River Basin Disaster Resilience and Sustainability by All that will be created by DioVISTA/Flood.

\* River basin society: a society that is established in a river basin formed by elements of the natural environment such as rain and by people’s lifestyles

### Challenges

### Solutions

**1** There is no general-purpose software for River Basin Disaster Resilience and Sustainability by All, and the analysis method differs for each contractor, making it impossible to evaluate risks from a unified perspective. In addition, the outsourcing cost is large.



Analyze everything from rainfall to inundation with one piece of software. Enable risk assessment of the entire river basin from a unified perspective. Contribute to cost savings through in-house execution of analysis work.

**2** We would like to check the cause of the incident before conducting the disaster site investigation, but it can not be analyzed immediately.



Contribute to quick survey preparation through a system that enables analysis integrated with maps in an ordinary PC environment.

**3** Analysis that needs a lot of information about rivers, floodplains, etc. requires enormous labor and time to set up and execute.



Standardize work with abundant functions and versatile operability, and speed up analysis. Significantly reduce the labor and time required for analysis.

### Effort Background

#### Where there’s a will, there’s a way. ~Being introduced to DioVISTA/Flood

Flood control which prevents inundation of rivers and develops revetments and reservoirs has aspects such as river management, disaster prevention and crisis management, and regional economics. Although the viewpoints are different, there is one objective of flood control. It is protecting people’s lives and livelihoods.

Dr. Taki, who researches River Basin Policy and Planning in the School of Environmental Sciences at the University of Shiga Prefecture, accumulated multifaceted experiences and insights related to flood control during the 18 years at his previous job as a staff member of the Flood Management Policy Office at the Shiga Prefectural Office, as well as during the time he was transferred to an office in the United States of America. With that broad knowledge, he emphasizes “the most important goal in minimizing flood disasters is to prioritize human life in any inundation.”

“I’ve been interested in flood disaster mitigation since I was a university

student majoring in civil engineering. I was involved in creating a flood disaster risk map for Shiga Prefecture using software when I was an employee of the prefectural government office, and I struggled with calculation results that changed depending on what specialist company the work was contracted to, and the program was a ‘black box’ that didn’t reveal its inner process. For River Basin Disaster Resilience and Sustainability by All, it was imperative to have software that could uniformly derive the inundation risk throughout the entire river basin,” Dr. Taki said.

Dr. Yamaguchi, the developer of DioVISTA/Flood in Hitachi’s Research & Development Group, came across Dr. Taki’s ideas and was impressed.

“I was surprised that the prefectural government would do so much, and I contacted him to suggest that he try using DioVISTA/Flood, which was under development. If engineers like us are in charge of software development so that Dr. Taki and others involved in hydrological engineering can focus on their main work, I think we will be able to reach our goals soon. Dr. Taki says ‘Where there’s a will, there’s a way.’ I believe that Japan will significantly change if this type of effort becomes widespread.”

### Outcomes that DioVISTA/Flood has Brought

#### The more we analyze, the more we can understand the “feeling” of the water

What outcomes did DioVISTA/Flood bring to Dr. Taki, who is aiming to create a safe and secure society by uniformly analyzing the inundation risk through the entire river basin?

“Previously, we spent a huge amount of time, money, and effort simulating inundation throughout Shiga Prefecture, but with DioVISTA/Flood, which has a fast calculation process, it can be done in a short time and uniformly. It’s not just about inundation prediction and risk assessments; it’s also excellent in terms of ease-of-use and calculation speed which make it easy

to conduct trial-and-error,” said Dr. Taki. He continued, “The more engineers analyze using DioVISTA/Flood, the more they will be able to understand the ‘feeling’ of the water.

Associate Professor, Department of  
Environmental Policy and Planning,  
School of Environmental Sciences,  
the University of Shiga Prefecture

Dr. Kentaro Taki



DioVISTA/Flood makes a huge contribution to training hydraulic engineers who can sense this feeling.”

Dr. Yamaguchi explained the purpose of developing DioVISTA/Flood, which is used at the forefront of river basin research. “We focused on developing high-accuracy software that helps with River Basin Disaster Resilience and Sustainability by All and can be easily used on our own PCs.”

Chief Researcher, Intelligent Information Research Department, Center for Technology Innovation - Advanced Artificial Intelligence, Research & Development Group, Hitachi, Ltd.

Dr. Satoshi Yamaguchi



## Comprehensive measures across rivers and cities will become the mainstream of flood control in the future

We asked Dr. Taki, who receives consultations on River Basin Disaster Resilience and Sustainability by All from all over Japan, about the future of flood control in Japan.

### Future Plans

#### DioVISTA/Flood as a human resource training tool for developing hydraulic engineers

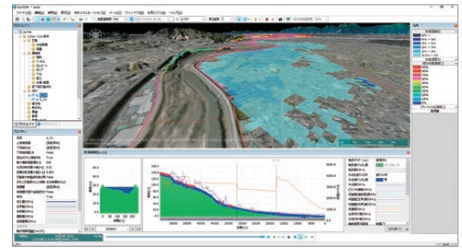
DioVISTA/Flood is expected to be used in a wide range of fields such as disaster prevention, social infrastructure systems, construction, and property insurance, and Dr. Taki focuses on utilization in the research and education fields.

“Seeing many catastrophic flood disasters, a large number of students who want to contribute in the field of River Basin Disaster Resilience and Sustainability by All in the future are drawn to my laboratory as well. When I introduce my laboratory, I show everyone results we calculated with DioVISTA/Flood and say to them, ‘These are the kinds of things we’re able to do now. Let’s take this data to the region and think with the local residents about the best way to evacuate.’ This makes everyone’s eyes light up. Being able to create something that is truly useful to people with their own hands inspires students’ feelings toward social contribution. I would like to emphasize that before students study equations of motion and continuity, it’s important to show them the purpose of the mathematical formulas they are learning,” Dr. Taki said.

#### For flood disasters, the speed of information reporting is critical. Establishing DioVISTA/Flood in all prefectures of Japan

Hitachi Power Solutions, in conjunction with Hitachi, has announced

“In the future, it will be standard practice to take comprehensive measures for river and city development together as a whole, assuming that the river will overflow. In order to ‘protect people’s lives and livelihoods,’ we



DioVISTA/Flood display screen

need to know exactly how rivers are inundated, when and how much our homes will be inundated, and what risks we have in places such as schools, companies, or hospitals. Using DioVISTA/Flood makes this possible. Since this is related to city planning and housing development, it is expected that creation of more secure and fulfilling communities will take place throughout Japan,” said Dr. Taki.

Dr. Yamaguchi, the developer of DioVISTA/Flood, said that he has the same ideas as Dr. Taki, who regards river and city development as one thing.

“The first objective of developing this software 15 years ago was disaster prevention. As the times have changed and inundation caused by climate change is repeatedly occurring, we have built DioVISTA/Flood under a comprehensive concept across rivers and the cities.”

development of “new technology to automatically draw up reservoir discharge plans” that contributes to minimizing flood disasters caused by inundation. Dr. Yamaguchi explained the details.

“This is a solution that simulates discharge of various types of reservoirs through DioVISTA/Flood and derives the optimal solution from among several patterns. In preparation for practical use, we would like to have many academic researchers including Dr. Taki use it, and we’ll update it based on their opinions. In FY2021, Hitachi Power Solutions plans to release it.”

Dr. Taki suggests that it is necessary to help more software such as DioVISTA/Flood become widespread in order to promote a new framework for the new era.

“If a flood disaster occurs, the guidelines for reconstruction depend on providing information as soon as possible, such as the location of weak points in the area, the timing of inundation, whether evacuation is necessary, and how residents may need to change their lifestyles in the future. For example, if DioVISTA/Flood is installed by all prefectural offices in Japan and there is someone in each of them who can operate it, it will be possible to take measures to gain the initiative in rebuilding the river and the city,” said Dr. Taki, looking ahead to the upcoming era in which disasters will be more frequent.

In response to these ideas, Hitachi Power Solutions will provide solutions that contribute to the improvement of regional resilience and support the realization of a better society.

### User’s Profile



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#### Department introduction

“Don’t look for answers. Search for problems” is the department concept, and the students learn to develop the autonomy to discover for themselves the problems that nobody else noticed. A major feature of the department is that the necessary items are all present for the process of students finding, clarifying, and solving problems while learning with a problem-oriented style that does not entirely fit within conventional academic fields. Dr. Taki’s field of research is River Basin Policy and Planning, which draws many students who have dreams of making a social contribution in the area of River Basin Disaster Resilience and Sustainability by All in the future.

Website of the Department of Environmental Policy and Planning, School of Environmental Sciences  
<https://depp-usp.com/>



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