

## “Resources, Energy and Social Infrastructure” field

**Achievement : Contribution to development of innovative concept on river basin management and reduction of water-related disasters**

### Dr. Yutaka Takahasi

Born: January 28, 1927 (Age: 88)

Professor Emeritus, University of Tokyo

### Summary

We humans benefit from rivers in our day-to-day lives, but on occasion, suffer severe damage from bank collapse due to swelling river waters. Dr. Yutaka Takahasi has conducted field surveys and data analysis on post-war flood disasters, such as those caused by typhoons, and scientifically verified that transformations in river basins due to large-scale river improvements and developments from the Meiji Era onward have contributed to the magnification of the scale of floods. In addition, in order to reduce the scale of flood damage, he has continued to propose “integrated flood control measures,” which aim not only to make river improvements such as the building of banks but also to achieve basin management through regulating reservoirs and the maintenance of a sound water cycle. Dr. Takahasi’s proposal has also been applied to measures against flood disasters frequently occurring worldwide which have been attributed to global warming.

### River improvements and basin transformation from the Meiji Restoration onward as the background for large-scale floods

Dr. Takahasi was born in Shizuoka Prefecture in 1927. He grew up in a rural area where the underground water of Abe River gushed forth. In 1947, two years after the end of World War II, he entered the Second Faculty of Engineering, Department of Civil Engineering at the University of Tokyo. As to the reason for his applying for that department, he commented, “At the time, not only was the country devastated by the war, but it also suffered major flood disasters every year. I believed that restoration from disasters was the first step towards rebuilding the country.”

In actuality, during the 15 post-war years, catastrophic typhoon disasters of historic scale occurred one after another. Typhoon Kathleen, which landed Japan in the year Dr. Takahasi entered the university, destroyed the bank of Tone River and submerged the eastern part of the capital city, Tokyo. Also in 1959, Typhoon Vera (known as Ise Bay Typhoon) took the lives of 4,697 people.

Dr. Takahasi conducted field surveys on flood disasters from Ty-

phoon Kathleen onward. In 1953, as a graduate student, he conducted a survey on Chikugo River in Kyushu, southern Japan, and marked an important milestone by elucidating the correlation between historical transformation in the land developed after the Meiji Restoration and flood disasters.

At this point, Dr. Takahasi focused on observations from older local residents. They said “floods these days occur quickly,” and “compared to our younger days, rain falling upstream comes downstream much more quickly than it used to.”

Why was that? The Meiji Government proactively imported western science and technology and as far as river technology was concerned, in 1872, invited a Dutch technician to launch a modern river improvement operation. At that time, the government built continuous banks in major rivers so as to protect people who had been suffering from floods for many years. Their course of action was not to let even a droplet of water outside the bank even in the event of a major flood.

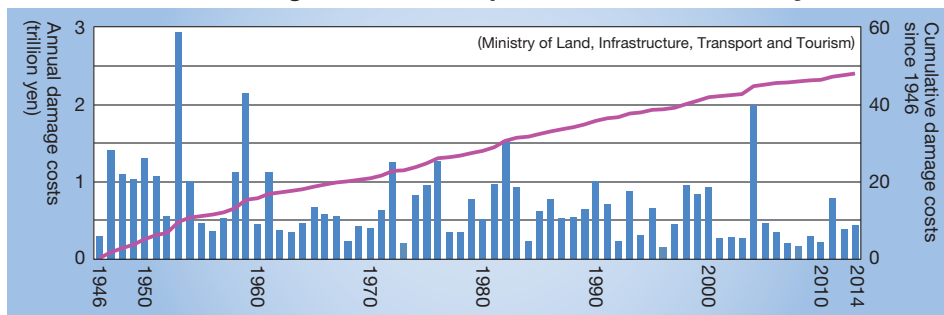
Through this approach, small to medium-size floods were controlled from Taisho to Showa Eras; however, at the same time there was a phenomenon in which the flow rate increased each time a flood occurred. Before the building of a bank, a small overflow would occur upstream, delaying water from concentrating in major rivers. However, with continuous banks, large volumes of rainwater now arrived at downstream urban areas in a short period of time.

Dr. Takahasi carefully studied old reference materials remaining in the local communities as well as weather and river data, and scientifically clarified that basin transformation accompanying river improvements and development from banks after the Meiji Era has contributed to the increase in the flood scale. In 1955, he wrote an article entitled “Gradual Alteration in the Flow Characteristics of the Chikugo-River Flood.”

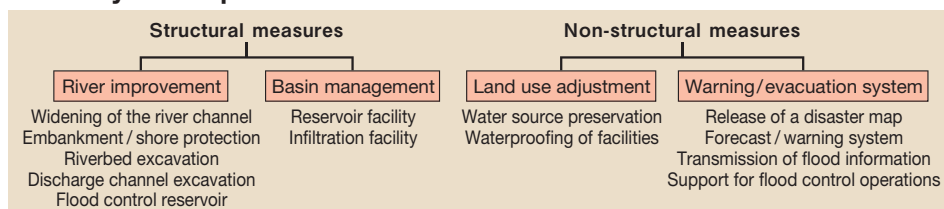
### Introducing basin management concept to flood control consisting only of structures such as banks

Typhoon Ida (known as Kanogawa Typhoon) which hit Japan in 1958 served as a trigger for Dr. Takahasi to contemplate the effects that urbanization has on flood damage. After inflicting severe damage on Shizuoka Prefecture in central Japan, Kanogawa Typhoon hit around Enoshima, an island near Yokohama, for the second time. Tokyo and Yokohama were undergoing a rapid urbanization around that time, with increasing population and development of new residential areas around rivers. At the same time, forests and fields, which can retain water in case of heavy rains or storms, were diminishing. Large-scale flood damage occurred in such areas. Similar flood damage also occurred consecutively in the 1960’s, and Dr. Takahasi coined the

### Transition in the damage costs due to post-war floods (trillion yen)



### Summary of comprehensive flood control measures



This is an example of the present “comprehensive flood control measures,” which is a realization of Dr. Takahasi’s river philosophy. Not only is river improvement the goal, but also through non-structural measures such as water source preservation and maintenance of a sound water cycle, the reduction of flood disaster risks as well as protection of lives in the event of a disaster are targeted.

### Example of the comprehensive flood control measures of Tsurumi River



The multipurpose retarding basin under normal conditions

During flood control

(Ministry of Land, Infrastructure, Transport and Tourism)

A large-scale multipurpose retarding basin has been created in the Tsurumi River area, which suffered severe damage caused by the Kanogawa Typhoon in 1958. When the river volume increases, the water is channeled into the retarding basin, thereby preventing the flooding of the residential areas.

phrase for such phenomena, “urban-type flood damage.”

Dr. Takahasi became assistant professor of the Faculty of Engineering at the University of Tokyo in 1961 and took up a professorship there in 1968. He inspired his students to study by often telling them to “look closely at the rivers.” That meant not only observation of the river itself, but also the geographical features of the river basin and flora, and furthermore the lives of the people living there. Dr. Takahasi’s research can be said to be the origin of “interdisciplinary research,” not confined to a specific discipline.

In 1971, Dr. Takahasi published a new perspective obtained from such extensive field surveys in a book entitled “Land Transformation and Flood Disasters.” In his writing, proposals to implement flood control measures in relation to the river basin were incorporated, and not merely flood control with structures such as banks.

This new concept led to major changes in national flood control projects. From 1980 onward, “integrated flood control” measures were implemented to suppress flood runoff by building retarding basins and regulating reservoirs in areas where rainwater flows into major rivers. In particular, this approach was implemented nationwide starting with urban areas with major rivers running through them, which suffered intensified flood damage due to post-war development. These measures brought about far reaching effects on the mitigation of flood damage.

### **Efforts to counter flood disasters in the monsoon region Changing the world through renewed river philosophy**

Dr. Takahasi has been peering into Japanese rivers since the end of World War II. In 1990, he wrote a university text book entitled “River Engineering,” in which a renewed river philosophy, not seen in conventional river engineering, was incorporated in many areas. Conventionally, emphasis was placed on flood control and water utilization along the river course (the course to which water runs), but more important is to widen one’s perspective to the river basin. Additionally, suggestions were made to contemplate the effects that river projects have on the environment and to consider public involvement in river planning. A new river engineering system was created that integrates the river, the natural environment and residents’ living space into one.

Furthermore, Dr. Takahasi proposed to protect the “sound water cycle” in the nation’s water administration. Before that time, water was categorized into rivers, underground water and agricultural water, and managed independently by respective administrative sectors. However, in order to efficiently utilize this precious resource, he asserted the need for law that allows for a unified management in the light of the water cycle of the river basin. His idea was reflected in the “basic water cycle law” sponsored by a cross-party group of lawmakers that was enacted in 2014.

As an overseas endeavor, Dr. Takahasi developed a cooperation system of 13 countries in the Asia monsoon region, where the natural and social environment is similar to that of Japan, and has exerted himself to establish regional cooperation and human resource development in this field. As a result, flood damage in this region has been mitigated and improvements in the river environment have been achieved. In particular, regarding the cyclone disaster in Bangladesh which claimed approximately 140,000 lives in 1991, he authored the United Nations report that proposed to “improve the provision of information and shelter for evacuation over bank improvement.” Based on the proposal, improvements with ODA assistance also progressed, so that in a similar-scale storm surge disaster which occurred in 2007, the victims were reduced to approximately 4,000.

In 2009, the International Journal of Water Resources Development, the most prestigious specialized international journal in the water resources sector, issued a special issue dedicated to Dr. Takahasi, featuring an individual for the first time in the journal’s 25-year history to praise his great contributions in the field of water resources and flood control.

In recent years, amid frequent occurrences worldwide of large scale flood disasters deemed attributable to global warming, new flood control measures and water resource management are sought after. The river philosophy advocated by Dr. Takahasi will no doubt live on as the foundation of flood control measures of the next generation.