

# The Features of Tateyama Sabo and Their Value

Shoetsu KATO<sup>1</sup>, Koji MORITA<sup>2</sup>, Masahiko ICHII<sup>2</sup>, Hitoshi MORITA<sup>2\*</sup> and Koji TAJIKA<sup>2</sup>

<sup>1</sup> Toyama Prefectural Government, Public Works Department, Japan

<sup>2</sup> Sabo-Sediment Control Division, Toyama Prefectural Government, Public Works Department, Japan

\*Corresponding author. E-mail: hitoshi.morita@pref.toyama.lg.jp

## INTRODUCTION

Efforts to prevent sediment-related disasters such as sediment catching works and afforestation have been promoted throughout Japan from the 17th century onwards, and erosion control work was advancing in Aichi Prefecture, Yamanashi Prefecture, etc. even in the 1880s. Sabo Law was established in 1897 and sabo works based on the law began in Nagano, Gifu, Shiga, and Okayama Prefectures in 1898.

In Toyama Prefecture, a landslide occurred in the Tateyama Caldera due to the Hietsu Earthquake of 1858, and enormous amount of unstable sediment was produced. Precipitation in the upper stream of the Joganji River originating from the caldera exceeds 5,000 mm/year. The Toyama plain, downstream of the Joganji River, has been damaged by debris flows and flooding many times.

For that reason, a project to protect the people and properties in the Toyama plain was launched by the Toyama Prefectural government and taken over by the national government. It has been serving its purpose steadily and persistently for over 100 years.

We will review Sabo works in Japan carried out at the same time as Tateyama Sabo, and report on the evaluation of its features and the role it has played.

## HISTORY OF TATEYAMA SABO AND ITS MAJOR FACILITIES

The Toyama Prefectural government embarked on sabo works in the Tateyama Caldera in 1906. The prevailing construction method in those days was stonework. The facilities were destroyed by repeated debris flows.

In particular, facilities in an upstream region suffered destructive damage from a catastrophic flood in July 1922. The Toyama Prefectural government then requested that the central government undertake those projects as national projects, and sabo works at the Tateyama Caldera began to be carried out under the direct control of the central government in 1926.

The construction period of the Shiraiwa Sabo Dam was limited to about 5 months a year because of snow, and the work had to be carried out in the harsh natural mountain environment. The Tateyama Sabo works were achieved through the following three innovations: (1) technical innovation of facilities using cement in construction, (2) technical innovation of construction method using construction machinery, (3) considering that sabo works serve different purposes depending on the location and sediment dynamics leading to the creation of a concept called a "watershed sabo system".

Specifically, the combination of upstream facilities such as the Dorodani Sabo Dams, which retain the sediment production by cascades of sabo dams and hillside works, and the Shiraiwa Sabo Dam, which stops debris flows, and midstream facilities such as the Hongu Sabo Dam, which retains debris and controls debris flows to ensure safety downstream, has been established as a type of watershed sabo system that provides a model for sabo works around the world. Through the development of these facilities, the safety of the Toyama Plain has dramatically improved, and it

contributes greatly to the development of the area, such as an increase in the population and sophistication of land use, and still demonstrates its continuing effect.

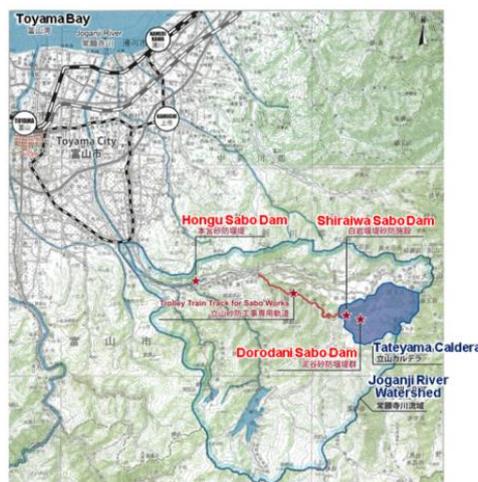
**Table 1** Damage caused by the Joganji River and the progress of disaster prevention works

year	Main events
1858	Hietsu Earthquake occurred.
1891	Johannis de Rijke drew up an improvement plan for the Joganji River.
1906	Toyama Prefecture started Sabo works at the Joganji River and construction of the Dorodani Dams.
1913	Construction of Yukawa Dam No.1 was started.
1919	Yukawa Dam No.1 was burst by a debris flow.
1922	While the Yukawa Dam No.1 was under repair, it was burst again by a debris flow.
1926	The national government took over direct control of the Sabo works.
1929	Revetment works began at the Shiraiwa Sabo Dam.
1937	Hongu Sabo Dam was completed.
1938	Dorodani Sabo Dams were completed.
1939	Shiraiwa Sabo Dam was completed.

## CONCLUSIONS

While there are other sabo facilities in Japan that were earlier and still exhibit their effect, Tateyama Sabo combined three representative facilities which continue to serve different purposes corresponding to the situation and while preserving their original shape and function, making it a textbook example of a “watershed sabo system”.

Tateyama Sabo Work is a combination of technology and wisdom to minimize the damage caused by sediment discharge under very severe conditions and as such, there is value in knowing about it as an existing model for a watershed sabo system. We will continue the efforts to share the results of these facilities around the world, and to pass them to the future generations as a precious heritage.



**Fig. 1** Location of Tateyama Sabo facilities

## REFERENCES

- Akagi, M. (1974): Methodologies of Japan’s Sabo Works in Meiji and Taisho Periods: Japan Sabo Association  
 Akagi, M. (1936): Journal “*Suiri to Doboku*”, November issue, pp. 21-22.  
 Hayashi, M *et al.* (2014): Universal Value of Tateyama Sabo from the Viewpoint of National Resilience, Interpraevent2014 in the pacific rim, p. 34

**Keywords:** Tateyama Sabo, watershed sabo system, world heritage