The Structure of Sabo Administration

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Chapter 1 : The Spirit of Sabo

Since ancient times, mountains have been regarded in Japan as the sacred habitat of deities. They also have supported the production activities necessary for the establishment of the nation and its cities by providing building materials for the construction of urban areas, temples, shrines and private houses, fuelwood for manufacturing salt, iron, roof tiles and ceramics, living materials required for warming and cooking, fertilizer materials for enriching fields etc., and mountain areas thus play a vital role in people's lives. Even in the modern era in Japan with the advent of Shinkansen bullet trains, the diffusion of IT and the availability of space trips, the age-old faith people have in mountains and their respective value remains unchanged. Meanwhile, mountains have taken on greater multilateral values including serving as beautiful ranges for tourism, verdant forests for enhancing health and well-being, along with providing the power of vegetation for the prevention of global warming.

At the same time, the innate balance of mountain areas, which offer many essential benefits, is maintained within the realm of nature, and this balance is often disturbed by various effects of human activities. Folklore has it that long ago a dragon living in the mountains ran wild and caused extreme terror for villagers. This dragon is said to symbolize a debris flow and flooding. Excessive human impact on mountain regions causes beneficial rivers and springs to dry up, trees to disappear from devastated mountain sides, the production of sediment-instead of mushrooms and timber-which is swept downstream every time it rains affecting settlements at the foot of mountains during disasters. Perhaps the old folk tale serves as a warning from ancient people concerning the

careless destruction of our mountains. Sabo is a word originating from the Japanese language which means "sediment control," and consists of two kanji characters representing "sediment" and "prevent," respectively. It is generally said to have evolved from a phrase in the text from the Ministry of Civil Affairs Notice No. 2 issued by the Meiji Government in 1871: "overflow of sediment must be prevented. "Apparently, the word "sabo" was used since the beginning of the Meiji period and became established as a term that adds to the concept of sand arrestation (work to prevent sediment discharge in Edo period) by incorporating the notion of prevention of sediment-related disasters in the legal system and living activities as well as in construction methods and engineering works.

The idea that, as an agricultural people, the Japanese should honor and protect the mountains and forests, which generate water and provide beneficial elements for living, has remained unchanged since ancient times. In agreement with this, sabo has remained an unwavering concept to us over the years (**Photo 1**).

Sabo is aimed at restoring the natural environment, destroyed by sediment runoff caused by natural phenomena such as major earthquakes, volcanic eruptions, torrential downpours, typhoons or human-induced phenomena resulting from manmade and production-related activities, to its original harmonized state in order to reduce and mitigate the threat of natural disasters affecting human life. For this purpose, the protection of forests and conservation of mountains and river basins are important in protecting human lives and arable fields downstream from disaster areas, and in revitalizing the local communities. At the same time conserving, recovering and creating beautiful and bountiful nature, which is the starting point of sabo, is also a key aim. This is the

reason why many of the sabo engineers are graduates of the department of forestry, faculty of agriculture (unfortunately, “agriculture” and “forestry” departmental names have disappeared from many universities and have been replaced by natural environment or biological environment departments, etc.).

Photo 1 : Mt. Miwa and Omiwa Shrine (Sakurai City, Nara Prefecture)

Chapter 2 : The Beginning of Sabo Administration

Tracing documents back to the origin of the idea of forest conservation in Japan leads to a notification issued in 677, the era of Emperor Temmu, that states, "Cutting and harvesting plants on Mt. Minamibuchi and Mt. Hosokawa and burning of mountains and fields in the regions surrounding the imperial capital is prohibited." Hosokawa is located in what is currently called Asuka Village in Takaichi County, Nara Prefecture, and adjacent to this area runs the Tohno River, the headwater of the Asuka River in the Yamatogawa River System (Photo 2). About 1.5km southeast of Hosokawa is an area called Inabuchi, in which the grave of Minabuchi no Shoan is located on a hilltop. Minabuchi no Shoan was a monk who visited Tang Dynasty China in 608 as one of the eight Japanese student envoys to China, and returned to Japan in 640 and had a considerable influence on Prince Nakanooe and Nakatomi no Kamatari. Directly downstream of the Tohno River is the famous Ishibutai Tomb and the ruins of the Asuka Inabuchi Palace are situated to the immediate north, which shows that this area was in the environs of the capital.

One well-known Imperial decree issued in 806 states, "On Mt. Oi in Kadono County, Yamashiro Province, flooding of river water submerges the dikes under water" and "therefore, cutting of trees on the river banks shall be prohibited." The river mentioned here is what is currently known as the Katsura River in Kyoto Prefecture.

Photo 2 : The Tohno River as it is now
(near Hosokawa in Asuka Village, Nara Prefecture)

The purpose of the notification and decree mentioned above has been debated: They may have been for appeasing the god of the mountains who brings harm, for preventing residents from entering the mountains which were assets of the government and aristocrats, or for forbidding the cutting of trees from the viewpoint of sediment control or for preventing sediment discharges. The origin of sabo administration can be found in an official central government document issued in 821, as a regulation on activities in forest areas, which were sediment production areas overseen by sabo administration in terms of national land management.

The document warns against depending on weirs and ponds for securing agricultural water required for paddy cultivation and instructs on preserving the mountains near rivers for securing water supply. The reason explained by the document is that mountains generate clouds and rain, rivers located in mountains with rich vegetation in their basins always have abundant water and the water level in rivers in destroyed basins is low. The document states that cutting down trees causes depletion of water and it bans the cutting of any tree or plant in riverside areas regardless of whether they are public or private. This central government document is the first one to appear that clearly expresses in writing the idea of cultivation of the water source. Accordingly, it can be regarded as the beginning of sabo administration in terms of an explicit document based on the concept of sabo.

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Chapter 3 : Sabo Administration in the Edo Period

It was not until the Edo period, when an orderly society was established and economic activities flourished under a stable regime, that forest conservation policies as part of sabo administration for the prevention of sediment discharge were developed as clear administrative planning.

Section 1. Advancement of destruction and raised bed rivers

In the Edo period, after the end of a long war-torn era, flood control works including the large-scale shifting of channels in the Tone and Yamato Rivers, etc. came to be implemented, more and more new arable fields were developed and increased food production brought about significant population growth which in turn spurred economic progress. As a result, common forests other than those owned by the Shogunate, feudal clans, or large business proprietors, became the source of exploitation for animal feedstuff, fertilizer, fuel, materials for the construction and repair of houses and other building, etc.

For example, it is said that in the 17th century the destruction of Mt. Tanakami in Shiga Prefecture became prominent due to sediment discharges. One reason is that mat rush cultivation and production of mattings were popular as auxiliary activities in addition to agriculture in the settlements around Lake Biwa, which created high demand for turpentine oil required for nighttime work. Common forests were exploited to manufacture the oil and the mountains became devastated.

As supporting evidence of this is the large amount of Kanei Tsuho coins used in the Edo period, which were discovered in the area where work was carried out in 1892 to dig a tunnel 7.5m below the Yanomune

River bed in Yasu Town, Shiga Prefecture. This means that the area was flatland in the 17th century, when the coins found 7.5m below the riverbed were in circulation, and subsequently the riverbed was rapidly raised **(Photo 3).**

Section 2. "Regulations of Mountains and Rivers"

The Yodo River Basin in the Edo period had a large population centered in Osaka, which was referred to as the "Kitchen of the Nation" and was prosperous with vigorous commercial and industrial activities and water-borne transportation. Economically it was the most important region for the Shogunate Government of Edo.

In 1660, the Shogunate issued a proclamation under joint signature of Inaba Mino-no-Kami Masanori (Lord of Mino Province), Abe Bungo-no-Kami Tadaaki (Lord of Bungo Province), and Matsudaira Izu-no-Kami Nobutsuna (Lord of Izu Province) to the provinces of Yamashiro, Yamato and Iga in the Yodo River Basin prohibiting removal of waste roots and to order planting of saplings on bare mountains.

Subsequently, a set of rules were announced as a binding law: the famous "Regulations of Mountains and Rivers" under joint signature of Kuze Yamato-no-Kami Hiromoto, Inaba Mino-no-Kami Masanori, Abe Bungo-no-Kami Tadaaki and Sakai Uta-no-Kami Tadakiyo (Chief of the Bureau of Music) dated February 2, 1666. The Regulations state the following:

- In recent years, mountain plants have been dug out including their roots, which causes sediment runoff in channels that prevents water from flowing. Accordingly, from now on plants must not be dug out entirely including their roots.
- Trees on the sides of rivers near their headwaters in mountains

National Route 8 and the Yanomune River running above the route

The Yanomune River after completion of lowering of the riverbed

Photo 3 : Yanomune River (Yasu Town, Shiga Prefecture) [1)]

have been decreasing. Saplings must be planted to prevent sediment discharges.

- No new fields should be cultivated, and no bamboos, phragmites or reeds are to be grown or extrusions made along the channels or on the bank of a river that narrows its cross section.
  Supplementary provision: No fields should be burned in mountains.

The regulations show that specific and strict control and management were required.

Section 3. Sabo works centered in the Kinki Region implemented by the Shogunate Government

In 1683, the civil engineering technician and merchant Zuiken Kawamura visited the source of the Yodo River and offered his opinion to the Government that the prevention of sediment runoff causing blockage at the mouth of the Yodo River required sabo works upstream. This prompted the Government to repromulgate in 1684 the Regulations of Mountains and Rivers which was revised with even stricter rules. At the same time, the Government ordered 11 feudal lords in the Kinki region including the Tsu, Yodo and Zeze Clans to plant saplings on bare mountains and lots after removal of waste roots and to prohibit field burning. This was apparently the first Shogunate-led sabo project.

In 1689, the Government appointed the three clans Honda of Yamato Koriyama, Todo of Tsu, and Inaba of Yodo as doshadome bugyo (magistrate in charge of sabo) and constables under four town magistrates in Kyoto and Osaka as doshadome kata (official in charge of sabo). In addition to these regulations and forestation works, the techniques of direct sabo to control sediment generation itself discharged from bare or devastated mountains by simple

hillside works proved effective coupled with the establishment of implementation systems and organizations. (Indirect sabo means sediment control that uses structures such as dams as in the Dodo River dam in Hiroshima Prefecture, described later, to indirectly control the sediment generated and discharged. Needless to say, both direct sabo and indirect sabo are important.) As a result, the concept of forest improvement became even more enhanced.

The technical capabilities of those days are believed to have been far from sufficient in dealing with natural disasters such as earthquakes and volcanic eruptions and there was nothing that could be done except to regard such phenomena as acts of God and wait until the situation became manageable. That is why stringent regulations were imposed to counter ever greater destruction due to human-induced causes such as unrestrained logging that would lead to disasters.

In the background of this trend was Banzan Kumazawa (1619-1691), a scholar who emphasized the importance of forest conservation. Influenced by another scholar, Toju Nakae (1608-1648), during his youth, Kumazawa worked for Lord Mitsumasa Ikeda of the Okayama Domain and taught forestry and agricultural administration. In his book "Shugi Gaisho," a compilation of his ideas, Kumazawa described that cutting down plants and digging out roots of trees in mountains would cause disasters and states that political corruption and disorder would lead to poverty of people, who would then not hesitate to cut down an excessive amount of trees for fuel, and forests would accordingly be destroyed (**Photo 4**).

Photo 4 : Portrait of Banzan Kumazawa [2)]

In April 1713, the Government promulgated the Ban on Felling of Trees on Owned Mountains, which prohibited cutting down of bamboo and trees without permission, whether owned by the Government or farmers. In addition, the Ban on the Development of New Fields was issued in 1742, and forest conservation policies were implemented in an even more stringent manner.

Section 4. Sabo of Feudal Domains

Similar to the proclamations issued nationwide by the Government, feudal clans also issued ordinances and reinforced measures for prevention of forest devastation in their domains. Even before the promulgation of the Regulations of Mountains and Rivers by the Government, many local ordinances were issued including the Prohibition of Tree Stump Removal by the Okayama Domain in 1642, the Ban on the Removal of Forests and Tree Stumps by the Wakayama Domain in 1645, the Prohibition of Forest Felling by the Tsu Domain in 1648 and the Ban on Stump Removal by the Kanazawa Domain in 1660.

After promulgation of the Regulations of Mountains and Rivers, domains continued to issue regulatory ordinances with even tighter control. In the Akita Domain, for example, forest rangers were appointed in 1668 and oleasters were planted as trees for sand control in 1751. Forest regulations were also tightened in the Tokushima, Moriyama and Hiroshima Domains. Sabo administ ration in the Fukuyama Domain (Hiroshima Prefecture) is examined as an example.

Section 5. Sabo in the Fukuyama Domain

In the Fukuyama Domain, the Ordinance for Mountain Control was issued in January 1704. The content of the written acceptance

of it remains in the possession of the Okamoto Family in Kinosho, Fukuyama City, and it states as follows:

"Acknowledgement
This document is to acknowledge for future reference the ordinance that gives the following orders to the entire village:

- None of the trees shall be cut down and weeding is not permitted in Otateyama.
- None of the live trees on Noyama shall be cut down.
- Neither Unjoyama nor the bushes shall be dilapidated. However, normal felling is permitted if the amount is small. Large-scale felling shall be subject to authorization with a permit.
- None of the thick cedar, cypress, paulownia, oak, zelkova or camphor trees around the residence shall be cut down. If the trees are required, felling shall be subject to permission. Tree branches that hinder the use of fields may be cut without permission.
- Replacement in Ohayashiyama as well as of bamboo and trees must be reported.

Signatures of recognition of the parties concerned must be obtained to prevent cutting in Ohayashiyama, groves or bushes. Any offence shall be subject to punishment without delay including any warden and official concerned as well as the offender himself.

Village headman"

Otateyama (also called Oyama, Tateyama, Tomeyama, Tatebayashi or Akiyama) means a domain-owned forest in which hunting and felling are prohibited and Noyama (also known as Iriai Kariyama or Iriai Noyama) means a mountain mainly managed by a village and used as a source of grass for fuel and fertilizer, to which common

right of one or more villages is stipulated. Unjoyama is a mountain to offer for trade such as commerce, industry and hunting, to which a certain tax is imposed as a type of miscellaneous tax for the domain to collect as revenue. Ohayashiyama refers to a forest directly owned and maintained by the Government or domain. Control of such forests was extremely strict for maintaining the function of cultivation of the water source, prevention of sediment discharges, windbreaking etc., as well as for providing materials for public use including civil engineering and construction and severe punishment including death and banishment in exile was imposed on those conducting illegal felling.

After that, the Fukuyama Domain issued the "Additional Ordinance for Strict Prohibition of Unauthorized Felling on Any Mountain including Privately-Owned Ones" dated December 16, 1830 to establish a thorough felling license system.

(1) Sunadome of the Fukuyama Domain

The sabo administration of the Fukuyama Domain, including ordinances, was as described earlier, and shows that strict forest conservation policies were implemented. This section presents Sunadome, the oldest type of sabo dam in Japan, constructed by the Fukuyama Domain and its residents, which is now regarded as a local heritage treasure and still protects the basin from disasters.

In Fukayasu County, especially in Kannabe Town, of the Bingo District in the eastern part of Hiroshima Prefecture, about 50 Sunadome sabo dams still exist that were constructed during the Fukuyama Domain period. This area is in the Ashida River Basin that stretches across Hiroshima and Okayama Prefectures. The river is one of the largest in the Chugoku Region with its source

located in Daiwa Town of Kamo County, Hiroshima Prefecture (at an altitude of 570m), and a basin area of 860㎢ and a main channel length of 86km.

The topography of the basin can be characterized by plateaus 200-500 m above sea level in the upstream area and alluvial plains including the Kannabe and Fukuyama Plains in the downstream area. The climate can be classified as mild Inland Sea climate with an annual mean temperature of 12-15 degrees C. The precipitation of the area is only about 2/3 of the national average with an annual rainfall of 1,600mm in the upstream region and 1,200mm in the downstream area.

The geology is mainly composed of granite generated at the time of igneous intrusion, which was physically weathered into decomposed granite soil and has become prone to erosion by flowing water.

In the Fukuyama Domain, the concept idea of Sunadome was apparently developed in around 1697 and there is mention of Sunadome in a village document dating from 1734 in existence; a few of such dams still remain in their original shape today.

Katsunari Mizuno, the first feudal lord of the Fukuyama Domain, was a cousin of Ieyasu Tokugawa and the Abe Family, which took the lordship later, and was a powerful hereditary vassa of the Tokugawa Shogunate. This naturally gave the successive feudal lords of the Fukuyama Domain important posts for administering state affairs including members of the Council of Elders. Agricultural fields that generated money to cover the expenses for serving such posts were an important source of revenue and Sunadome that would protect the fields from disasters were the most essential faci

lities of the Fukuyama Domain. Especially during the lordship periods of Masayasu Abe in the 1830s and that of Masahiro Abe, who became the premier member of the Council of Elders, construction of Sunadome reached its peak (**Photo 5**). These Sunadome still remain as robust structures that provide a sense of security in the area (**Figure 1**).

The Sunadome sabo dams are also reasonable in terms of their structural design and it is a source of pride that these structures built in the Edo period are by no means inferior to the masonry dams in various regions of Japan believed to have been built under guidance of de Rijke, a Dutch engineer employed by the government in the Meiji period.

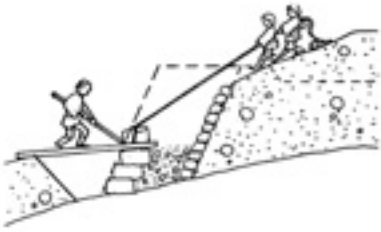
Famous examples of Sunadome are described in the following sections.

a) Fukamizu Sunadome (dam height: 4.1m, dam length: 25.4m)

On hillsides, which provide a source of sediment, generation of sediment is directly prevented by hillside works and discharge due to unstable sediment in the mountain stream and erosion of banks is prevented by the dam, which also stops the sediment from the upstream area to indirectly control the sediment discharge down-stream. This superb integration of direct and indirect sabo shows that the aim of sabo projects was already achieved here.

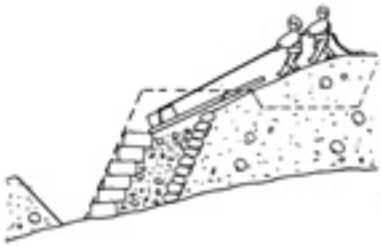
This Sunadome includes three levels and the bottom was constructed in 1854, an addition of 1.8m was built as the middle level in 1864 and the wing was raised in 1883, which comprises the form the dam is now. With the two large distinctive mirror stones mounted at the center of the middle level, which communicate the desire to keep

Photo 5 : Portrait of Masahiro Abe [3)]

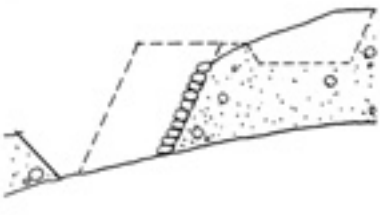


④ Stone stacking from below

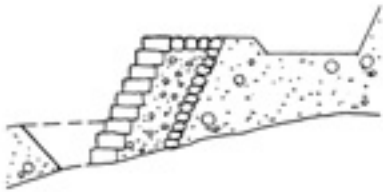
① Accumulated sediment



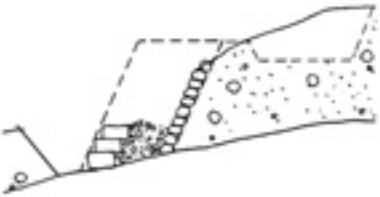
⑤ Stone stacking from above



② Open-cutting and sediment retention works



⑥ Completion of Sunadome and construction of sedimentation basins



③ Start of construction of front stone row

Figure 1 : Presumed method of Sunadome construction[4)]

disasters away, the beautiful masonry dam/Sunadome is reminiscent of an ancient castle. The planar shape presents a gentle arch and the front slope inclination is about 6 arcmin (**Photo 6**).

b) Dodo River Sunadome No. 6 (dam height: 13.3m, dam length: 55.8m)

This is the largest of all the existing Sunadome. The Dodo River includes six large dams over its main flow starting with the first Sunadome downstream up to this sixth one, and ten smaller Sunadome in the upstream region. The large number of Sunadome as compared with the basin area of 2.7 km^2 indicates that the area was seriously devastated in past disasters.

The original Sunadome was a large dam mentioned in a record from this period entitled "Toto Yoteki": "Shimogoryo Village: In July 1835, laborers were signed up for the construction of the big Sunadome along Toto." The works to enlarge the dam were started in 1835. The original Sunadome was apparently built in 1773, which was used as the foundation for building the lower layer in 1835 and the mid layer added for bank raising in 1882. On top of it is the uncoursed masonry in the upper layer, which had its stones removed once and restacked at the time of implementation of the sabo environment improvement project in 1976 for lowering the channel works in the sedimental area. In short, the dam is composed of four layers built in the three periods of Edo, Meiji and Showa.

The sedimental area has been developed as a park and provides a place not only for local festivals and events but also for recreation and relaxation (**Photo 7**).

Photo 6 : Fukamizu Sunadome forecited 4)

Photo 7 : Dodo River Sunadome No. 6 forecited 4)

Section 6. Major Methods of Sabo Construction in the Edo Period

Table 1 and Figure 2 show major methods of hillside works implemented in the Edo period. Initially, hillside works comprised mostly plant works, but torrent control works gradually became common and dams built with stones as in the Sunadome in the Dodo River of the Fukuyama Domain came to be constructed. This is likely to have provided a good grounding for smooth technology transfer from the Western countries that occurs later in the Meiji period.

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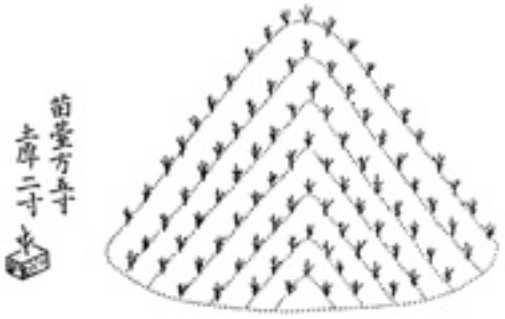
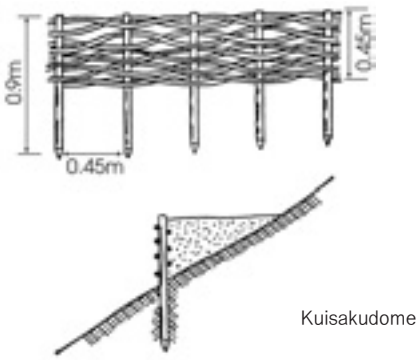
Table 1: Methods of Sabo Construction in the Edo[5)]

Sujishibadome	A bare mountain is dug up horizontally at intervals of 80cm, along which sod strips are arranged and the gaps are filled in with sedi ment.
Tobimatsudome	Planting holes are made on a hillside at vertical and horizontal intervals of 80cm, in which small pine trees of about 1m are planted.
Kuisakudome	Piles are driven into a hillside and fences are built with split bamboos or fascines.
Yoroidome	Pine logs about 30cm in diameter are laid in a mountain stream to use as sleepers, on which small pine logs of about 2cm at the tip end are arranged to form several layers; pine logs are laid on the top part, clay is put on the back embankments built on the sides.
Ishigakidome	Pine logs of at least 30cm in diameter are laid in a small channel, on which a masonry is built to a height of 2-2.5m, cobblestones are put in by about 1m as a backfill and clay is mixed in and tamped down.
Sakamatsudome	Pine fascines of about 1m in length are laid with the top inside and the root outside on a hillside or spur to form a layer of 3-4cm, which are covered with sediment, leaving the ends exposed. Several of such layers are made to reach a height of about 80cm.
Tsukidome	An embankment 1-2m in height is built with earth across a normally dry mountain stream in a small channel, which is sodded on the surface.
Ishizeki	Broken stones are piled up and the inside of the pile is tamped with clay to form a dam.
Jakagodome	Also known as Ishikagodome and used in rivers with gravels beds. Bamboo gabions 70cm in diameter and 4m in length are made and stones are filled in them, which are secured with piles to form a dam.



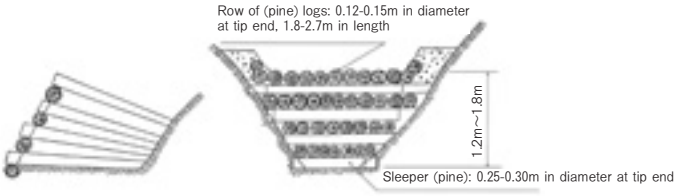
Tobimatsudome

Sujishibadome



Kuisakudome

Figure 2 (1) : Methods of sabo construction in the Edo period [forecited 5)]



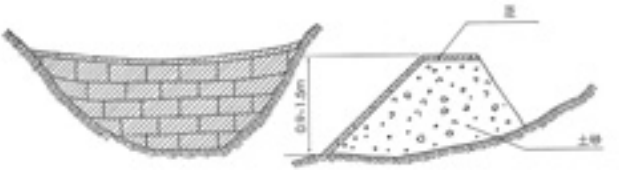
[Yoroidome]

[Ishigakidome]

[Sakamatsudome]

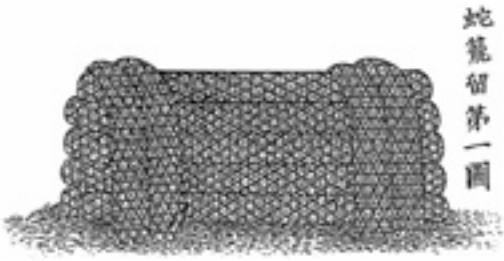
[Sakamatsudome (cross section)]

Figure 2 (2) : Methods of sabo construction in the Edo period [forecited 5)]



[Tsukidome]

[Ishizeki dam]



[Jakagodome]

Figure 2 (3) : Methods of sabo construction in the Edo period [forecited 5)]

Chapter 4 : Sabo Administration in the Meiji Period

Section 1. Yodo River Water Source Sabo Law

At the time of the establishment of the Meiji Government in 1868, laws and institutions for forest control, etc. under the Shogunate system disappeared. The first incidence of sabo administration by the new government was the investigation for sabo works in the Kizu River Basin of the Yodo River Water System conducted under the Ministry of Civil Affairs in 1870. During the following year, a notification for the prevention of overflow of sediment containing five articles was issued as Ministry of Civil Affairs Notice No. 2.

"1. For new development of mountains, the quality of the land shall be thoroughly studied and those concerned shall build raised paths all around any of their fields to prevent overflow of sediment (rest omitted)."

The word "sabo" is said to have originated from this phrase concerning the prevention of overflow of sediment, as described earlier.

In September 1873, the Meiji Government issued the so-called "Yodo River Water Source Sabo Law" in the Ministry of Finance Additional Notification, which states that "care shall be taken to observe the Yodo River Water Source Sabo Law as per annexed paper," for Kyoto, Osaka, Nara, Shiga, Sakai, and Mie Prefectures. This is the first instance of use of the word "sabo." (The Ministry of Finance Notification in the possession of the Shiga Prefectural Library is the "Yodo River Water Source Sand Control Law," to which a memorandum from Osaka to Shiga refers as "methods of sediment control for the mountains at the source of the Yodo River.")

The Yodo River Water Source Sabo Law contains eight articles:

Rule 1: Cutting of vegetation and cultivation shall be prohibited in any land concerned if privately owned. If cutting or cultivation is absolutely necessary, the provincial governor shall attend to the case by providing authorization standards with topography, etc. taken into consideration.

Rule 2: If there is any possibility of sediment runoff from fields on a slope of a spur or at a valley mouth, the provincial governor shall take preventive measures.

Rule 3: Any bare ground on a hillside shall be planted with selected vegetation. If the vegetation does not develop or take root, measures such as change of types of vegetation shall be taken.

Rule 4: Sabo works shall be implemented by taking advantage of past experience and appropriately selecting effective techniques. Further study shall be made if it does not produce tangible results. Sabo works of a scale too large for the local authorities to carry out shall be presented to the government for instructions.

Rule 5: Cost of such sabo works to which Rule 2 applies shall be appropriately funded by obligating the owner of the fields. Otherwise the cost will be covered by the national treasury according to the provisions published.

Rule 6: For the accomplishment of the purpose of this law, target areas shall be specified based on the geographical features and circumstances. Appropriate measures shall be taken including setting of a timetable of the works.

Rule 7: Areas under alternating jurisdictions in a basin shall be subject to consultation between the provincial governors concerned for defining the scope of jurisdiction. It must not be unilaterally determined.

Rule 8: Prefectures concerned with this basin shall dispatch officials for the disposal of affairs according to the geographical features of the areas in their jurisdictions.

The Law incorporates the backbone concept of Japan's sabo administration and projects including the prohibition of and restriction on disaster-inducing acts, methods of sabo works, sharing of the expense incurred, division of target areas, management method, etc.

Section 2. Dutch and Japanese sabo engineers

Engineers Van Doorn and Lindo were invited from the Netherlands in February 1872 and Escher, Thissen, de Rijke and others came to Japan as government-employed engineers the following year.

The Dutch engineers returned back home in succession one after another by around 1880 (Mulder went back to the Netherlands in May 1890), except for de Rijke, who stayed in Japan for 29 years until 1901 and made significant contributions and left great achievements in the improvement of the entire civil engineering technology not to mention sabo and social capital enhancements in Japan.

The assignment of Van Doorn was aimed at making improvement plans for major rivers and providing instructions on the sabo works. The opinion brief he submitted after visiting the Fudo River (Kizu River System: Yamashiro Town, Soraku County, Kyoto) in 1873 provided the basis for the Yodo River Water Source Sabo Law described earlier.

In 1874, de Rijke also conducted an investigation in cooperation with Escher on the conditions of destruction in the upstream region of

the Yodo River, for studying the cause of riverbed aggradation at the mouth of the Yodo River. After this investigation, the Dutch engineers proposed prohibition of unrestrained logging, implementation of hillside works and construction of sabo dams in the upstream region for stabilizing the downstream river sections. This was the beginning of the flood control works under direct control of the Ministry of Home Affairs, which was conducted in the Kizu River Basin under the guidance of de Rijke and company in 1874. At this time, de Rijke submitted an opinion brief that suggested the following:

1. The side of accumulated sediment should be provided with rows of straw bundles dug into it for the prevention of sediment runoff.
2. Dams of wood, stone, earth, etc. should be built in valleys in low mountains.
3. Measures should be taken to protect the banks of the raised bed river running from the foot of the mountain into the Kizu River.

In 1875, de Rijke supervised the implementation of sabo works in the Fudo River, which Van Doorn had visited, covering 16 methods including masonry dam (**Photo 8**). In Hontani, in particular, he constructed a huge masonry dam 64m in length for securing water for agriculture, the right bank of which was partly damaged by the Minami Yamashiro Flood Disaster in August 1953. Later a new sabo dam was built downstream and unfortunately the original dam has been lost (**Photo 9**).

Also in 1875, Kyoto engineer Yoshikata Ichikawa constructed the Aitani Sabo Dam, a large masonry dam with a reservoir, in Aitani of the same basin, which is still in existence more than 130 years later (**Photo 10**). Ichikawa is famous for devising sodding work, a unique

Photo 8: de Rijke in his later days[6] and the de Rijke Sabo Dam (in the Fudo River)

Photo 9 : Hontani Sabo Dam immediately after the Minami Yamashiro Flood Disaster in 1953 [7)]

Photo 10 : Aitani Sabo Dam built by Yoshikata Ichikawa [forecited 7)]

Japanese technique for hillside works, as compared with the straw bundle row works designed and invented by de Rijke, and he is also known as the author of "Suiri Shimpo," a comprehensive guide to flood control and sabo technology in Japan (**Figures 3 and 4**).

Another noteworthy Japanese engineer of remembrance in addition to Ichikawa is Gisaburo Tanabe. Before dying an early death at the age of 32, Tanabe designed and built the Dutch Sabo Dam and the Yoroi Sabo Dam in the Tanakami Mountain System located in the upper reaches of the Seta River of the Yodo River System, which even today maintain their beautiful appearance and secure the safety of the downstream reaches (**Photos 11 and 12**).

De Rijke brought with him to Japan his wife Johanna, daughter Anna, son Jan and his wife's sister Elsje but lost his sister-in-law in 1879 to cholera. In 1881, his wife also died in Japan, when she was only 32 years old.

De Rijke left the following remarks behind as he left Japan:

1) For river projects in Japan, characteristics of the individual river must be thoroughly understood in advance. It is also important to have a good understanding of the necessity of forest conservation and sabo as the basis of flood control.
2) Regarding forest conservation projects in mountains in the upstream areas, sabo projects in the midstream and upstream regions and river projects in the downstream areas, administration and investigations must be conducted under an integrated system encompassing from the upper reaches to the river mouth.
3) Based on the preceding two points, it is necessary to be prepared to continuously measure various data on the individual rivers for an accurate understanding of their characteristics.

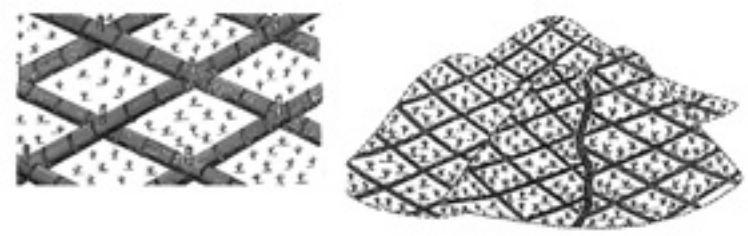


Figure 3 : Straw bundle row works [forecited4)]

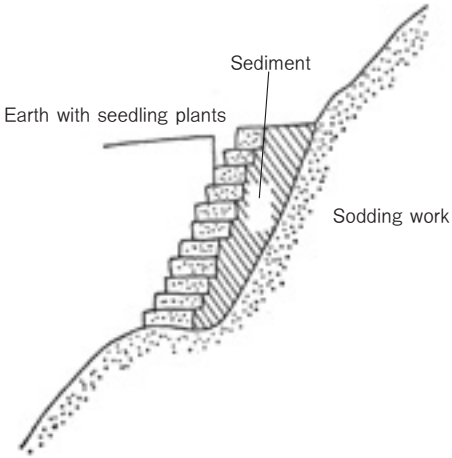


Figure 4 : Sodding work [forecited5)]

Photo 11 : Dutch Sabo Dam forecited 4)
(Courtesy of the Otsu Forestry Office of Shiga Prefecture)

Photo 12 : Yoroi Sabo Dam forecited 4)
(Courtesy of the Otsu Forestry Office of Shiga Prefecture)

These words of advice remain valid today. His achievements include his presentation on the importance of sabo to the government and his efforts to secure budgets for sabo in addition to technological expertise.

Subsequently in 1903, Amerigo Hoffman of Austria came to Japan and provided guidance on the design of sabo works in Seto City, Aichi Prefecture. This led to more exchanges with Austria for Japan's sabo technology, including the study visits to Austria by Kitaro Moroto, then an associate professor at Tokyo Imperial University, and Masao Akagi of the Ministry of Home Affairs.

Various approaches to sabo were conducted at the local levels as well. In Okayama Prefecture, in particular, Enzaburo Uno's proposal on flood control was adopted and the draft for deliberation on sabo construction rules was approved in 1882. Sabo works were commenced the following year in the Takahashi and Asahi River Basins.

Uno declined an offer to become a village headman and instead decided to engage himself in sabo projects. At the age of 48, he became an official of Okayama Prefecture and devoted himself to forest conservation and flood control until 1907, when he was 73 years old. He not only compiled his ideas and expertise on sabo in books such as “Chisui Hongen Saboko Taii” and “Chisui Shokurin Hongen Ron” but also traveled to Mie, Gifu, Aichi, Kochi and Toyama Prefectures to provide technical guidance. In this way, many engineers and volunteers in the provinces offered their valuable time and services to work on restoring mountains from destruction (Photo 13).

Photo 13 : Enzaburo Uno and the sabo works monument with words of praise for his achievement (Soja City, Okayama Prefecture)[8), 9)]

Section 3. Sabo Law

The Sabo Law, which was enacted and promulgated as Law No. 29 on March 30 and went into effect on April 1, 1897, is known as one of the oldest existing laws in Japan. Article 1 states that sabo facilities shall be constructed for the purpose of sabo from a flood-control viewpoint and Article 2 provides that a designated sediment control area means the area where certain acts shall be prohibited or restricted for the purpose of sabo from a flood-control viewpoint.

Rivers in Japan have flooded countless times and have caused enormous amount of damage to the basin areas. The cause of such flooding was known to be closely related to destruction of the mountains upstream. Sediment is generated from destroyed mountain areas every time it rains, which flows into the river, raising the riverbed to form a raised bed river. At the same time, a large amount of sediment is carried by flood flows, which takes up a major part of the flow section, and the sediment deposition becomes high enough to make the land after a flood appear more like a sediment-related disaster than a flood disaster. No matter how much river improvement works are implemented including the raising of riverbanks, widening of the river, dredging up of accumulated sediment, or other means, river improvement in the downstream section does not yield results unless measures are taken to prevent or control runoff of the sediment generated in a destroyed or denuded area upstream.

The purpose of preventing sediment discharge from causing floods and generating disasters in this way or preventing sediment runoff, i.e. sediment-related disasters, is “the purpose of sabo from a flood-control viewpoint.”

To this end, a legal framework was established to designate destroyed areas that generate sediment, and areas with tremendous river destruction, etc. as designated sediment control areas where harmful acts should be regulated or controlled and proactive sabo works should be implemented.

Accordingly, protection of basins from flood and sediment-related disasters requires interrelated functioning of three laws: the Forest Law (1896) for the conservation of mountains, the Sabo Law for the prevention of sediment discharges and the River Law (1896) for the protection of downstream areas from flood disasters. These three laws are often collectively referred to as "Three Laws for Flood Control" (**Figure 5**).

In this way, the enforcement of the Sabo Law reinforced the structure of sabo administration in the Meiji period.

(1) Amendment of the Sabo Law

The following describes the major amendments to the law:

a) Amendment of 1924

Prompted by the measures for recovery and restoration from the Great Kanto Earthquake in 1923 and driven by the sabo measures for the Joganji River (Tateyama Sabo), the first amendment was made on July 18, 1924. The revision was made to Article 6-1 of the Sabo Law, which provided the criteria for sabo works under the direct management of the government. Originally, the criteria for the management or execution of construction of sabo facilities by the competent minister was limited to when sabo facilities were necessary for preservation of other prefecture's interests or their interests were not limited to within one prefecture. The amendmentextended the criteria to include when the construction

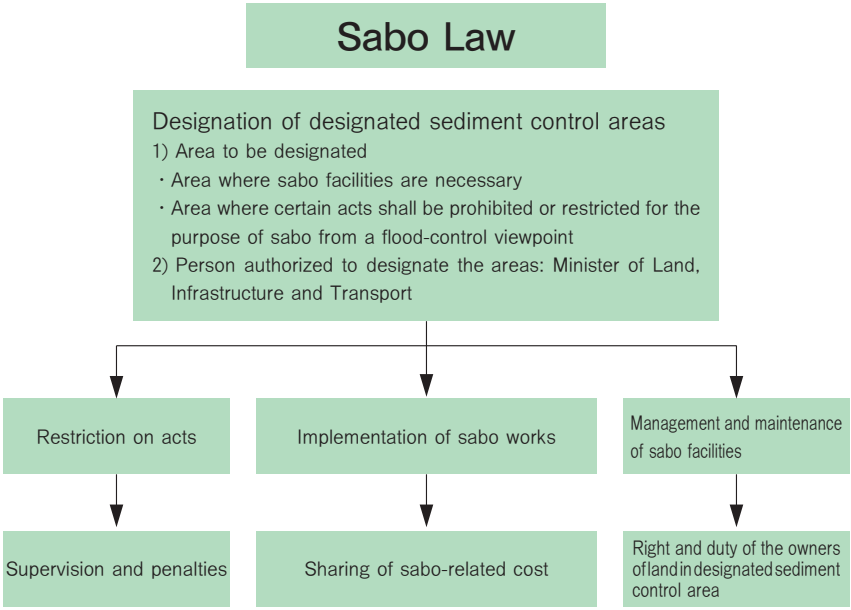


Figure 5 : Concept of the Sabo Law

was considerably difficult or construction cost was considerably high. The background of the revision will be described later.

b) Amendment of 1949

On May 31, 1949, Articles 13 and 14-2 of the Sabo Law were revised. The amendment to Article 13 was made regarding the sharing of cost for sabo works, which stated that 2/3 of the sabo facility construction budget should be borne by the national government according to a government ordinance instead of government subsidy to cover not more than 2/3 of that stipulated in the original text. This changed the cost sharing from subsidies to financial obligation of the government. Because forcing local authorities to bear

the burden of sabo projects, which is the national government's obligation, is against the concept of the Local Autonomy Law and the Local Finance Law, the burden was placed on the government.

The amendment to Article 14-2 was made in relation to the amendment to Article 13.

On March 31, 1993, Article 13 of the Sabo Law was amended in association with the amendment to the Law Concerning the Consolidation and Rationalization of National Subsidies Article 23 Supplementary Provision 4 to provide for the current national treasury' share, which will be described later.

c) Amendment of 1963

Article 3-2 was added to the Sabo Law, which states that provisions concerning sabo facilities shall apply mutatis mutandis to natural riverbanks specified by a government ordinance and located in designated sediment control areas that are significantly broken or buried due to flooding, restoration of which is necessary for the purpose of sabo from a flood-control viewpoint.

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Chapter 5 : Present-Day Sabo Administration

Sabo projects can be classified by operating body into those under the direct management of the national government and those subsidized by the government and executed by prefectures. The system of sabo projects currently implemented is shown in Table 2.

Section 1. Sabo projects under the direct management of the national government

The beginning of direct management of sabo works comprised half of the expenses for the Yodo River repair works in the Seta and Kizu Rivers (both in the Yodo River System) allocated to sabo cost as the supplement cost for prefectural sabo works in 1878.

The first sabo works under the direct management based on the Sabo Law were conducted in the Fuji River, which started in 1911. The ongoing sabo works in the Yodo River were continued as works covered fully by the national treasury not under the Sabo Law.

The Sabo Law provides that the national government may directly conduct the execution of construction of sabo works when:

- Sabo facilities are necessary for preservation of other prefecture's interests
- The interests of sabo facilities are not limited to within one prefecture
- The construction is considerably difficult, or
- Construction cost is considerably high.

Following the enactment of the law, sabo projects under the direct management of the government based on the law were commenced in the Kiso and Yodo Rivers, in which sabo projects had been

Table 2 : System of Sabo Projects

	Purpose		Project name
Directly managed	Disaster prevention	Devastated area	Sabo projects under direct management
			Sabo dam function enhancement project
		Volcanic area	Volcano sabo project under direct management
			Sabo dam function enhancement project
		Regional development	Safe community model project
			Sabo land space creation project
			Mizube no gakko (waterfront school) project
			Node for regional exchange "waterfront plaza"
		Environmental development	Project for creating green belts on urban hillside
			Specified local project for environmental improvement for rivers and other facilities
	Disaster measure	Disaster area	Disaster-related emergency sabo project under direct management
Subsidized	Disaster prevention	Devastated area	General sabo project
			Sabo dam function enhancement project
		Volcanic area	Volcano sabo project
			Sabo dam function enhancement project
		Regional development	Hometown sabo project
			Safe community model project
			Snow control sabo model project
			Mizube no gakko (waterfront school) project
			Node for regional exchange “waterfront plaza"
			Rivers and related public facilities improvement project
			Specified project for improvement of flood control facilities for housing and building land development
		Environmental development	Project for creating green belts on urban hillside
			Project for creation of affluent and lush streams
			Specified local project for environmental improvement for rivers and other facilities
		Non-structural development	Emergency improvement of the information basework
			Development project for interactive, sediment-related disaster information reporting system
			Volcanic eruption warning and evacuation preparedness emergency project
			Sabo-related basic investigation
	Disaster measure	Disaster area	Disaster-related emergency sabo project
			Sabo special emergency project for severe disaster
			Volcano sabo special emergency project for severe disaster
			Specified emergency sabo project

implemented before the enactment. While sabo works were conducted sequentially in devastated basins as sabo areas under direct management based on the provisions of the Sabo Law, the sabo projects under direct management for general safety of the basins by intensive promotion of construction were handed over to prefectural governors for implementation as subsidized sabo projects, the history of which is shown in Table 3.

For example, the earthquake disaster sabo project fund was established in 1924 for the restoration of water source areas mainly in the Tanzawa Mountain Mass region in Kanagawa Prefecture, which was devastated by the Great Kanto Earthquake on September 1 the previous year and five rivers in the area, namely the Sagami, Sakawa, Hayakawa, Hanamizu and Tama Rivers, were incorporated in the sabo areas under the direct management of the government. The subsequent improvement of the development led to the handover of the project to Kanagawa Prefecture in 1942.

The earthquake spurred the revision of the Sabo Law in 1924. Kanagawa Prefecture by itself was in no way capable of carrying out restoration and recovery from such a devastating earthquake. In July 1923, the Ministry of Home Affairs submitted a proposal for revision of the Sabo Law stipulating that the national government may conduct sabo works when the construction is difficult or the cost is considerably high.

Gonzo Terashima and Toyokazu Ishisaka, representatives of Toyama Prefecture, who were on the committee to deliberate on the revision, made an appeal for consideration of people living along the Joganji River, who had always faced the threat to life and assets ever since the Ansei Earthquake and suffered tremendous expense for the

Table 3(1): History of Sabo Projects Under the Direct Management of the Government[10)]

RDB name	Water/mountain system name	Starting year	Year of handover	Background of governmentalization
Tohoku	Mogami River	1937		Has many devastated areas in the system and suffered frequent sediment-related disasters. The disasters in 1921, 1927, etc. led to the start of direct management in 1937 based on the Third Flood Control Plan.
	Abukuma River	1936		Has volcanoes including Mt. Azuma and the Muroto Typhoon disaster in 1934, etc. led to the start of direct management in 1936 based on the Third Flood Control Plan.
	Kitakami River	1950	March 2002	Disasters caused by Typhoon Kathleen in 1947 and Typhoon Ione in 1948 led to the start of direct management in 1950.
	Akagawa River	1987		Has severely devastated areas in the Gassan Mountain System and suffered frequent sediment-related disasters. Direct management started in 1987.
	Hachimantai Mountain System	1990		Has four volcanoes: Mt. Iwate, Akita-Komagatake, Hachimantai and Mt. Akiata-Yakeyama. Direct management started in 1990.
Kanto	Tone River	1936	Ogawa River, etc. in 1955, Numao River in 1965, Tenryu River in 1968	Disaster in 1935, which caused 254 deaths, led to the start of direct management in 1936.
	Kinu River	1918	Kobyaku and Ojika Rivers in 1968	Is geologically fragile and suffered frequent sediment disasters. Disasters in 1910, 1914, etc. led to the start of direct management in 1918.
	Watarase River	1937		Had a denuded area at the Ashio Copper Mine ruins. Muroto Typhoon disaster in 1934, etc. led to the start of direct management in 1937.
	Fuji River	1911	Fuefuki and Midai Rivers in 1933.	Suffered frequent sediment-related disasters due to the fragile geology along the Itoigawa-Shizuoka Tectonic Line. Direct management started in 1911.
	Tanzawa Mountain System	1924	1942	Devastation of the Tanzawa Mountain System due to the Great Kanto Earthquake in 1923 led to the start of direct management in 1924. The development was completed and transferred to Kanagawa Prefecture in 1942.
Hokuriku	Shinano River Upstream	1918	Okada River, etc. in 1932-1935.	Has active volcanoes including Mt. Yakedake. The disaster in 1910, eruption of Mt. Yakedake in 1915, etc. led to the start of direct management in 1918.
	Shinano River Downstream	1937		The disaster in 1935, etc. led to the start of direct management in 1937 based on the Third Flood Control Plan.
	Joganji River	1926		Mt. Tombi collapsed (approx. 400 million m³) in the Ansei Earthquake of 1858. The successive sediment disasters in 1919, 1922 and 1923 led to the start of direct management in 1926.
	Tetori River	1927		The Hakusan Volcano Area is geologically fragile and suffered frequent sediment disasters. Disasters in 1914 and 1919 led to the start of direct management in 1927.
	Jinzu River	1919	Miya River, etc. in 1932	Mt. Yakedake is located in this area. The disaster in 1914, etc. led to the start of direct management in 1919.
	Hime River	1962		Suffered frequent sediment disasters including the collapse of Mt. Hieda due to the geologically fragile conditions of the Itoigawa-Shizuoka Tectonic Line. The disaster in 1961, etc. led to the start of direct management in 1962.
	Kurobe River	1961		One of Japan's most devastated and torrential rivers. The disaster in 1953 led to the start of direct management in 1961.
	Iide Mountain System	1969		Uetsu flood in 1967, which caused 81 deaths, led to the start of direct management in 1969.

Table 3(2): History of Sabo Projects Under the Direct Management of the Government [10)]

RDB name	Water/mountain system name	Starting year	Year of handover	Background of governmentalization
Chubu	Tenryu River	1937		Suffered frequent sediment-related disasters due to the fragile geology along the Median Tectonic Line. Direct management started in 1937 based on the Third Flood Control Plan.
	Abe River	1937		Suffered serious sediment runoff such as the Oya Collapse. The disaster in 1914, etc. led to the start of direct management in 1937 based on the Third Flood Control Plan.
	Kiso River	1937		The Yotsume River disaster in 1932, which caused 26 deaths, led to the start of direct management in 1937.
	Shonai River	1937		Destroyed due to mining of porcelain clay, etc. Direct management started in 1937 based on the Third Flood Control Plan.
	Kano River	1959		The Kanogawa Typhoon disaster in 1958, which caused 684 deaths, led to the start of direct management in 1959.
	Etsumi Mountain System	1968		The Oetsu disaster in 1965, which caused 21 deaths, led to the start of direct management in 1968.
	Mt. Fuji	1969		Direct management started in 1969 following the study by the Mt. Fuji Osawa Collapse Conference approved in a Cabinet meeting after the investigation started in 1967 in response to a request by the governor of Yamanashi Prefecture.
	Suzuka River	1945	1969	The rainstorm disaster of 1938, etc. led to the start of direct management in 1946. The development was completed and transferred to Mie Prefecture in 1969.
Kinki	Rokko Mountain System	1939		The Great Hanshin Flood in 1938, which caused 695 deaths, led to the start of direct management in 1939.
	Seta River	1878	Completed areas handed over in order	Deforestation for the construction of temples and shrines in the Nara period, etc. left the land bare. Direct management started in 1878 due to Yodo River bed aggradation.
	Kizu River	1878	Completed areas handed over in order	Deforestation for the construction of temples and shrines in the Nara period, etc. left the land bare. Direct management started in 1878 due to Yodo River bed aggradation.
	Kuzuryu River	1978		Mountains severely devastated by the Oetsu disaster in 1965. Direct management started in 1978.
Chugoku	Daisen Mountain System	1936		Muroto Typhoon in 1934 led to the start of direct management in 1936.
	Hiikawa River	1950	1961	The typhoon disaster in 1943 led to the start of direct management in 1950. The development was completed and transferred to Shimane Prefecture in 1961.
	Gokawa River, etc.	1944	1953	The disaster in 1943 led to the start of direct management in 1944 in Gokawa (Gonokawa) River and two other rivers. The development was completed and transferred to Shimane Prefecture in 1953.
	Kure City	1950	1951	Conducted until 1951 in Kure City, which suffered extensive damage due to the disaster caused by the Makurazaki Typhoon in 1945.
	Western Hiroshima Mountain System	2001		The rainstorm disaster in 1999 led to the start of direct management in 2001.

Table 3(3): History of Sabo Projects Under the Direct Management of the Government[10)]

RDB name	Water/mountain system name	Starting year	Year of handover	Background of governmentalization
Shikoku	Shigenobu River	1948		The disasters in 1943, 1945, etc. led to the start of direct management in 1948.
	Yoshino River	1971		Suffered frequent sediment-related disasters due to the fragile geology along the Median Tectonic Line. The disaster in 1965, etc. led to the start of direct management in 1971.
	Hiji River	1944	1967	The rainstorm disaster in 1943 led to the start of direct management in 1944. The development was completed and transferred to Ehime Prefecture in 1967.
Kyushu	Kuma River	1967		The successive sediment-related disasters in 1963, 1964 and 1965 led to the start of direct management in 1967.
	Oyodo River	1950	Okimizu River in 1973	Mt. Kirishima, an active volcano, is located in this area. The Makurazaki Typhoon disaster in 1945, etc. led to the start of direct management in 1950.
	Mt. Sakurajima	1976		Direct management started in 1976 in response to signs of volcanic activity on Mt. Sakurajima since 1972.
	Mt. Unzen	1993		Mt. Fugen erupted in 1990 for the first time in 200 years, which caused frequent pyroclastic and debris flows. Direct management started in 1993.
	Yamakuni River	1949	1952	The disaster in 1944, etc. led to the start of direct management in 1949. The development was completed and transferred to Oita Prefecture in 1952.
Hokkaido	Ishikari River	1971	Echanankeppu River, etc. in 1994	Mt. Tokachi, an active volcano, is located in this area. The disaster in 1970 led to the start of direct management in 1971.
	Tokachi River	1972		The Hidaka Mountain Range was severely devastated due to the Toyamaru Typhoon in 1954 and the disaster of 1955. Direct management started in 1972.
	Mt. Tarumae	1994		Eruption has repeated in intervals of every 35-70 years and the mountain may erupt anytime. Direct management started in 1994 to cope with the expected serious effects of eruption.

construction of levees, and made a statement that the proposal should also be applied to the Joganji River.

The sabo project that had been carried out in the Joganji River since 1906 experienced catastrophic damage due to the disaster of 1923, immediately before its completion. The committee understood the situation of Toyama Prefecture and the proposal for revision of the Sabo Law was passed. Subsequently in May 1926, the project was incorporated in a sabo project under the direct management of the government. At the same time, Masao Akagi assumed the post of the first director of the Tateyama Sabo Work Office.

One example of effort for early restoration from serious disasters in urban areas is the incorporation of the Rokko Mountain System into the sabo area under the direct management of the government in 1939, which followed the Great Hanshin Flood of 1938. Also in Kure City, which suffered a serious sediment-related disaster due to the Makurazaki Typhoon on September 17, 1945 after the Second World War, part of the Japan Aid Collateral Funds from the U.S. were allocated in 1950 for an intensive sabo project under the direct management that took place during the two years 1950 and 1951. More recently, a sabo project under the direct management of the government was implemented in the Western Hiroshima Mountain System in 2001 after the Hiroshima disaster of 1999.

Regarding volcanic disasters, a sabo project under the direct management was started at Mt. Sakurajima in 1976, which was followed by another project under the direct management in 1993 at Mt. Unzen-Fugen which erupted in 1990 for the first time in 198 years and caused catastrophic disasters with pyroclastic and debris flows.

Currently, sabo projects under the direct management can be classified into sabo projects and volcano sabo projects and are conducted in the basins shown in Figure 6.

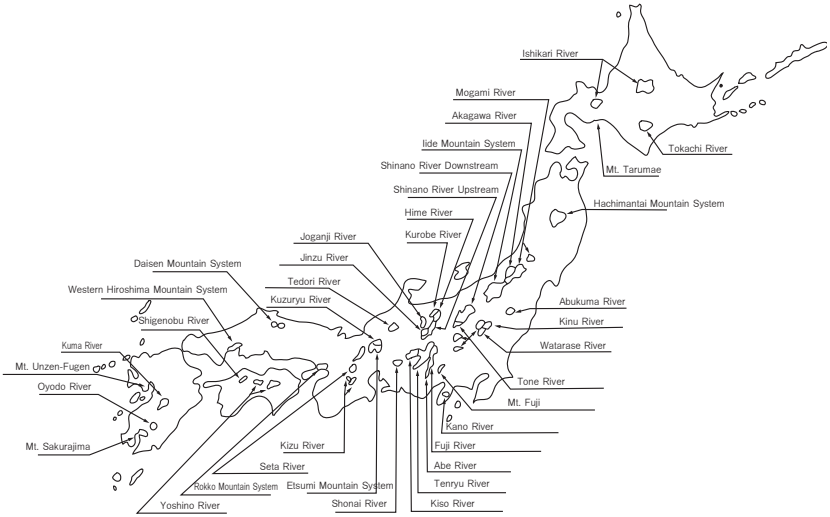
Sabo projects under the direct management of the government are intended to protect human life and assets from disasters by conserving basins and preventing riverbed aggradation in downstream rivers due to sediment generated and discharged from the basins.

Volcano sabo projects under the direct management of the government are aimed at protecting human life and assets from disasters caused by abnormal sediment discharges including volcanic mudflows, pyroclastic flows and lava flows resulting from volcanic eruptions, etc. by conserving basins in devastated volcanic areas and riverbed aggradation in downstream rivers due to sediment discharges.

For disaster measures, a system is in place that allows the implementation of sabo works as a disaster-related emergency sabo project under the direct control of the government when sediment that flows out of the water source area due to wind and flood damage, earthquakes, volcanic activity, etc. in the year concerned may cause damage to the downstream area if left untreated and emergency execution is required.

Section 2. Transition of sabo technology

In the Meiji period, sabo project-implemented areas increased along with improvements in species of sabo trees and their mass provision by nurseries, in addition to the hillside and torrent control works developed in the Edo period. The liberation from limitations on



Project name	No. of water systems under project implementation
Sabo project under the direct management of the government	34 water systems
Sabo project under the direct management of the government	23 water systems
Volcanic sabo project under the direct management of the government	19

Note: Eight water systems have both sabo and volcanic sabo projects being implemented.

Figure 6 : Locations of sabo projects under the direct management of the government [11)]

exchanges of information and people, which was intended for the maintenance of the feudal system by the Shogunate Government, is also believed to have encouraged the expansion.

It goes without saying that the technology transfer from foreign countries including the Netherlands made significant contributions to the advancement of sabo technology in Japan.

The main material used in structures was stone, a natural material, which was subsequently replaced by cement in the Taisho period. Use of this new material allowed for larger sizes of structures, reduced work periods, and the transition of techniques from hillside works as the major technique to dam construction in torrent control works and channel works. The increased sizes of dams led to the improvement of the maintenance rate. Nowadays various types of dams are built including slit sabo dams (**Photo 14**).

Along with the development of society and the economy, recovery of devastated national land progressed and, as sabo projects, preventive measures in basins with no noticeable devastation came to be called for in addition to the measures taken only in devastated areas. Quantitative evaluation of the effects of investment in sabo projects also became necessary. In response to these requests, Kotaro Kimura, the Chief of the Sabo Division, River Bureau of the Ministry of Construction in 1951, announced an initiative entitled "Concept for the Establishment of a Sabo Plan" in the magazine called "Kasen." This provided the prototype of a sabo plan with quantitative evaluation integrated.

Debris flows had never been recorded before during their actual movement and were sometimes referred to as something that

Slit sabo dam

Steel slit sabo dam

Steel grid sabo dam

Photo 14 : Various slit sabo dams [12)]

was almost "unreal." In September, 1971, however, the staff at the Matsumoto Sabo Office of the Ministry of Construction successfully shot an 8-mm video of the movement of a debris flow in the Kamikamihori Valley on Mt. Yakedake in Kamikochi. Since then, debris flow observation officially was commenced at some of the sabo offices under the direct management of the government and many findings have been obtained from the observational data so, far (Photo 15).

In response to the eruption of Mt. Unzen-Fugen in 1991, warning areas were specified based on the Disaster Countermeasures Basic Law for the prevention of damage and no one was allowed to enter the designated areas. However, heaps of volcanic ash flowed down as debris flows because of local rainfall. As rapid responses in sabo projects were called for, an unmanned construction system was developed. This technology was used in the eruption disaster measures at Mt. Usu and Miyake Island in 2000.

The development of such technology mainly for sabo projects under the direct management of the government has provided support for sabo administration.

Section 3. Subsidized sabo projects

Only a few sabo projects were conducted by prefectures prior to the enactment of the Sabo Law: Kyoto started in 1873, Yamanashi in 1881, Okayama, Gifu and Shiga in 1883 and Osaka in 1888. All of them mainly involved the utilization of hillside works.

The Sabo Law provides that sabo projects should serve the public welfare and should be projects of the national government. Practically, sabo projects are implemented by prefectural governors

Kamikamihori Valley, Mt. Yakedake (1962)[13)]

Nojiri River, Sakurajima (1984)[14)]

Photo 15 : Debris flows

under subsidy of the government, which is based on the idea that governors of prefectures as state organizations conduct the projects and the governors are paid the expense.

The enactment of the Sabo Law clearly defined subsidized sabo projects and projects started in Nagano, Gifu, Shiga and Okayama Prefectures in 1898 as subsidized sabo projects under the law. Subsidized sabo projects were also implemented in Fukushima, Tochigi, Mie, Fukui, Osaka and Hyogo Prefectures in the following year (1899) and more projects took place 1900 in a total of 19 prefectures including Osaka and Kyoto.

While the percentage of national subsidy at that time is said to have been 1/2, it actually varied between 1/2 and 2/3 depending on the prefecture, according to home affairs statistics.

The percentage of national subsidy, which was between 1/2 and 1/5 during the Taisho period, was specified to be 1/3 for torrent sabo works and 1/5 for hillside works. This was aimed at encouraging torrent sabo works by increasing the percentage.

In 1932, to help save impoverished farm villages from the serious recession caused by the Great Depression, the government implemented the Public Works Program for Relief to Farmers as an unemployment measure. In 1933, the percentage of national subsidy was increased to 2/3, which remained valid until 1992.

Meanwhile, the number of subsidized sabo project-implemented prefectures increased from 26 in 1931 to 40 in 1934.

In 1972, a subsidized sabo project was started in Okinawa Prefecture,

which was the last prefecture to commence sabo works in Japan.

Subsequently, a major revision in the percentage of national subsidy took place in 1993, and 5/10 and 5.5/10 has become most common.

(1) Disaster that spurred the start of debris flow control measures

On September 25, 1966, a settlement in Ashiwada Village (present Fujikawaguchiko Town) on the north coast of Lake Saiko, one of the Fuji Five Lakes, was hit by a debris flow. 31 people died in the Saiko District (population of 513) and 63 people died in the Nemba District (population of 235). The disaster was triggered instantaneously at around 1:00 a.m. and lasted some 30 minutes (**Photo 16**).

The Ministry of Construction issued a Sabo Division Director's Notice entitled "Submission of Data on Hazardous Mountain Streams" to the prefectures on October 14 of the same year to conduct an investigation. As a result, it was announced that there were 15, 645 "mountain streams that may be hit by a debris flow, adjacent to settlements subject to direct damage in the event of such flows," thereby potentially affecting some 430,000 homes. This disaster prompted the implementation of debris flow control measures intended for the protection and preservation of settlements.

(2) Disaster that spurred the start of non-structural measures

From 7:00 p.m. to 10:00 p.m. on July 23, 1982, an hourly rainfall amount exceeding 100mm continued, and the Nagasaki Flood Disaster centered around the City of Nagasaki City left 299 people dead or missing, 805 people seriously or slightly injured, 584 houses totally collapsed and 954 houses partially collapsed. Victims of sediment-related disaster accounted for 74 percent of all victims.

Nemba District struck by the disaster

Saiko District struck by the disaster

Photo 16 : Ashiwada Debris Flow Disaster (September 25, 1966) [15)]

Nagasaki, a city characterized by many slopes, contains numerous dangerous spots for sediment-related disasters. The Nagasaki Disaster indicated the need for comprehensive sediment-related disaster measures in areas with a convergence of zones subject to debris flows, landslide and slope failure as well as the significance of so-called non-structural measures, i.e. education of residents on accurate information about sediment-related disasters, early evacuation and securing of safe evacuation centers and evacuation routes. This disaster encouraged the implementation of non-structural measures including the Sediment Disaster Prevention Month, which started the following year (**Photo 17**).

(3) Various subsidized sabo projects

Subsidized sabo projects can be classified by their purpose into those for disaster prevention and those for urgently coping with disasters. Projects for disaster prevention can be further classified into those that contribute to regional or environmental development by their implementation and those for promoting non-structural policies.

Project areas may be either devastated regions or volcanic areas. Major projects are described in the following pages.

a) Disaster prevention

1) General sabo projects/volcano sabo projects

These sabo projects are intended for preventing devastated areas in basins and protecting human life and assets from sediment-related disasters such as debris flows. General sabo projects conducted in volcanic areas are referred to as volcano sabo projects. The percentage of national subsidy for general sabo projects is 5/10 and for volcano sabo projects is 5.5/10.

2) Sabo dam function enhancement projects (directly managed/

Susukizuka Town immediately after the disaster

Narutaki Town immediately after the disaster

Photo 17 : Nagasaki Flood Disaster (1982) [16)]

subsidized)
These projects are intended for removing earth and rocks from sabo dams filled with sediment to recover the sediment storing capacity, which improves the degree of safety against sediment-related disasters.

b) Regional development
1) Hometown sabo projects
Mayors of municipalities become the operating body and implement projects while maintaining coordination with regional plans.
2) Safe community model projects (directly managed/subsidized)
Sabo, landslide or slope failure prevention projects are intensively conducted in a group of districts including dangerous spots for sediment-related disasters and the surplus soil generated by the construction works is used for the development in securing safety zones (**Photo 18**).

3) Sabo land space creation projects (directly managed/subsidized)
These projects create safe spaces (sabo land spaces) required for the revitalization of communities through the treatment of construction byproduct generated by sabo projects (**Photo 19**).

4) Snow control sabo model projects (directly managed/subsidized)
In areas of very heavy snowfall, sabo dams for preventing sediment discharge due to avalanches, etc. and channel works with a snow removal function are provided (**Photo 20**).

5) Sabo education zone model projects
These projects are intended for the revitalization of communities and a better understanding of sabo by preserving historic sabo facilities and developing the surrounding environment.

Photo 18 : Safe community model project (safety zone created in mountainous areas with a high risk of sediment-related disasters: Watarase River in Ashio Town, Kamitsuga County, Tochigi Prefecture) [17)]

親水公園＝The amenity-oriented park
床　　固＝The groundsel
護　　岸＝The revetment

Photo 19 : Sabo land space creation project (contributes to the development of infrastructure including a sewage plant via the implementation of groundsel, revetment works, etc.: Fujimi Town, Suwa County, Nagano Prefecture) forecited 17)

Sabo dam in potential avalanche hazard area (Hakuba Village, Kitaazumi County, Nagano Prefecture)

Sabo project contributing to the development of a beautiful, snow damage-resistant community (Murayama City, Yamagata Prefecture)

Photo 20 : Snow control sabo model project [forecited 17)]

c) Environmental development

1) Project for creating green belts on urban hillside (directly managed/subsidized)

In cities located at the foot of mountain slopes, a series of tree belts are formed as greenbelts on the slopes adjacent to urban areas for the purpose of improving safety regarding sediment-related disasters and preserving and creating green-rich urban environment and scenic views. These projects also contribute to the prevention of unregulated expansion of urban areas and to the creation of green biotopes surrounding urban areas. (Figure 7)

2) Torrent control sabo incorporating water and vegetation projects (directly managed/subsidized)

These projects are conducted in basins with rich natural environment in light of conservation, restoration and creation of natural environment as well as securing safety regarding sediment-related disasters.

d) Non-structural measures

1) Emergency improvement of the information baseworks (sabo, landslide, slope failure)

These projects are intended for gathering information including that on precipitation and maintenance of treatment equipment, which are essential in the establishment of warning and evacuation systems to protect human life from sediment-related disasters (Figure 8).

2) Development projects for interactive, sediment disaster information reporting systems (sabo, landslide, slope failure)

To protect human life from sediment-related disasters, these projects are conducted with the objective of developing interactive reporting systems to share sediment-related disaster information between residents and administrative agencies (Figure 9).

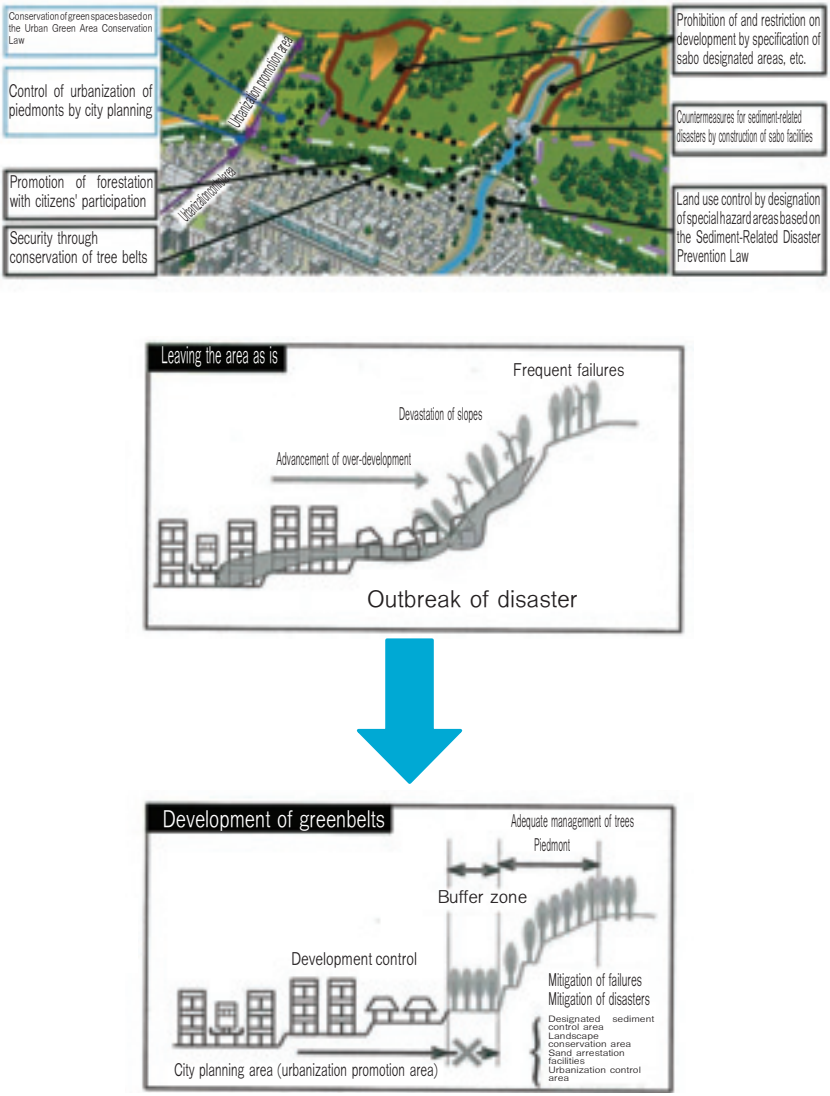


Figure 7 : Conceptual drawing of project for creating green belts on urban hillside forecited 17)

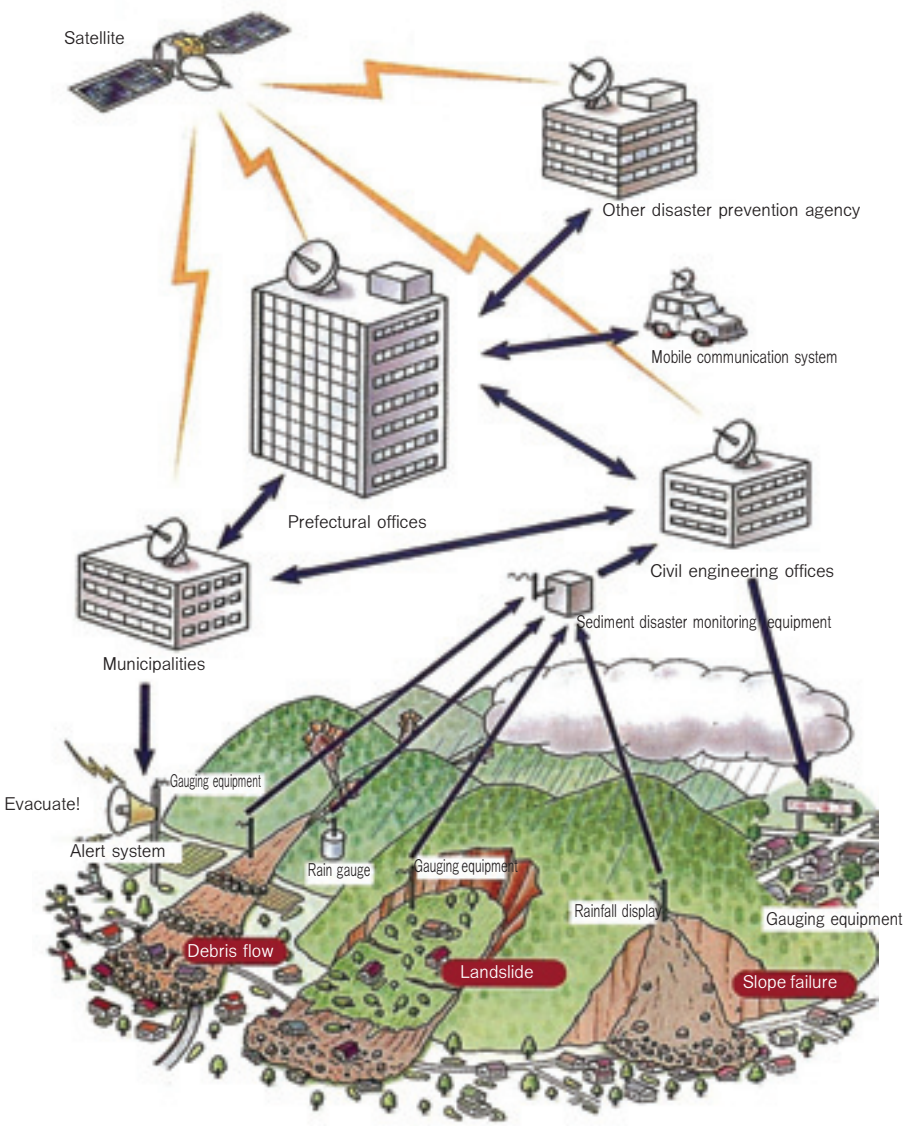


Figure 8 : Conceptual drawing of emergency improvement of the information baseworks [18)]

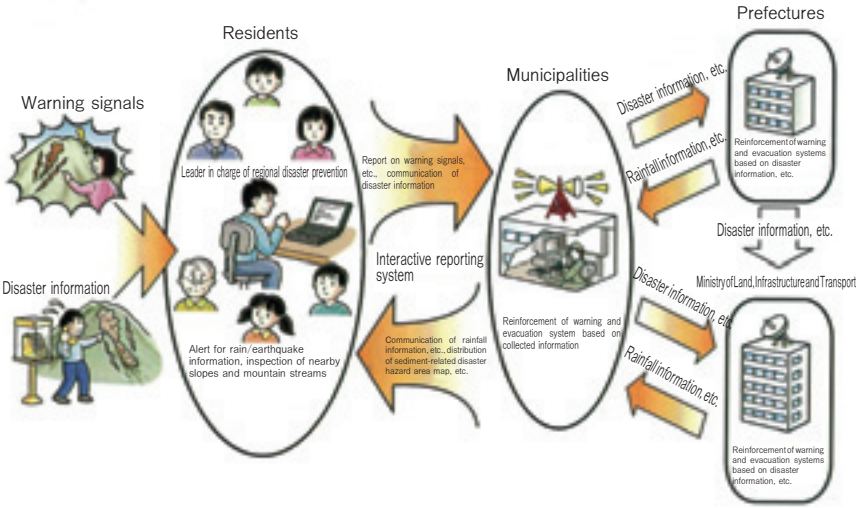


Figure 9 : Conceptual drawing of development project for interactive, sediment-related disaster information reporting system [forecited 18)]

3) Volcanic eruption warning and evacuation preparedness projects
For disasters caused by abnormal sediment discharges that are sudden, extensive and far-reaching such as volcanic mudflows, pyroclastic flows and lava flows resulting from volcanic eruptions etc., these projects are conducted for facilitating the establishment of the warning and evacuation system for residents of volcanic areas.

4) Sabo-related basic investigations (sabo, landslide, slope failure)
Investigations regarding the topography, geology, usage, etc. of land subject to sediment-related disasters are conducted based on the Sediment-Related Disaster Prevention Law and the information is utilized as the basis for designation of sediment-related disaster warning areas, establishment of warning and evacuation systems, etc.

e) Subsidized sabo projects as emergency measures for disasters

1) Disaster-related emergency sabo projects
When new collapses generated by wind and flood damage or earthquakes occur in areas not currently among the budgeted sabo project regions and such collapses could, if left untreated, cause damage to the lower reaches by possible subsequent flooding, urgent measures are required within the same fiscal year. In 1951, it was approved to implement works dealing with such situations as new devastation prevention sabo projects. Although construction in places other than the areas specified at the beginning of a fiscal year had not been permitted, it became possible to urgently budget works to cope with disasters and prevent possible disasters. This system is the original form of the present disaster-related emergency sabo projects.

In the present system, devastation of basins due to forest fires is

included in the causes of devastation covered.

2) Sabo special emergency projects for severe disaster
Unlike disaster-related emergency sabo projects, these projects are not designed for individual mountain streams but are implemented for entire areas hit by severe disasters within certain periods and based on certain plans. While budgets are formulated on a single-year basis, the overall budget for the four years required for redevelopment of areas hit by severe disasters can be appropriated in advance in this system. The project is budgeted as a disaster-related emergency sabo project for the year of the disaster and treated as a sabo special emergency projects for severe disaster for the next three years in principle. The percentage of national subsidy is 5.5/10.
3) Specified emergency sabo projects
This system is applied to disasters not larger than those dealt with as sabo special emergency projects for severe disaster and assumes three years including the year of the disaster as the period for development. The percentage of national subsidy is 5.5/10 for volcanic areas and 5/10 for others.
4) Volcanic sabo special emergency projects for severe disaster
These projects differ from sabo special emergency projects for severe disaster in that they are implemented for the entire areas hit by severe disasters due to volcanic activities such as eruptions and the period of development is 5 years. The percentage of national subsidy is 5.5/10.

Section 4. Landslide control

(1) Major landslide disasters

The Tertiary deposits distributed in and around Niigata Prefecture coincide with heavy snowfall areas and it is readily understandable

that this region has experienced frequent massive landslides. The oldest landslide on record is the one that occurred in the Donokama District in Ogi Town, Sado City, Niigata Prefecture in 1678 which caused the total or partial collapse of 40 houses. In 1681, a landslide occurred in the Arayama District in Matsunoyama Town, Tokamachi City, Niigata Prefecture, which caused the entire settlement to have to relocate.

Subsequent well-known landslides include the Nadachi Collapse caused by the Takada Earthquake on April 25, 1751, in which a back mountain collapsed in Nadachi Town of Joetsu City, Niigata Prefecture; all houses in the settlement tumbled into the sea and 428 people died.

The Chausuyama Landslide in the Shinonoi District on March 1, 1847 due to the Zenkoji Earthquake in Nagano Prefecture was also massive in scale.

In the Meiji period, two major landslides occurred in 1890; one on April 20 in Shorinzan, Takasaki City, Gunma Prefecture and another on April 23 in the Ronden Area of Himi City, Toyama Prefecture.

In July 1903, a landslide occurred in the Kamenose Area located on the border of Osaka and Nara Prefectures. The disaster area lies at the center of the gorge that runs across the Ikoma-Kongo Mountain Range from east to west in the middle reaches of the Yamato River Basin and the landslide clod that collapsed on the Osaka side in Kashiwara City raised the Yamato River, which submerged about 45 ha of the upstream area on the Nara side under water.

The landslide, which became active again on November 21, 1931, caused significant damage to the entire region by destroying a tunnel on the JNR Kansai Line (present JR Yamatoji Line), which was the main artery between Osaka and Nara, and a prefectural road. The maximum horizontal displacement was 40.7-53.0m and average daily displacement was 52.3cm. The bed of the Yamato River was raised by 20-36m (38.5cm/day) and the prefectural road that ran on the left bank was also raised by 31.9m. As a result, the Yamato River was blocked by the landslide clod and the flood area upstream reached 200 ha. A new channel was excavated as a countermeasure 50m south from the original river (**Photo 21**).

As described, landslide disasters have occurred in various parts of Japan including Yamagata, Niigata, Toyama, Ishikawa, Nagano, Kanagawa, Osaka, Tokushima, Saga and Nagasaki Prefectures and have caused serious damage to the regions as well as serious impact on socioeconomic activities.

(2) Landslide Prevention Low

In 1957, a landslide disaster struck the northern part of Kyushu. Saga and Nagasaki Prefectures, which suffered especially severe damage, enacted the Ordinance Concerning Financing of the Moving of Houses in Landslide Hazard Areas and made strong requests to the national government for the enactment of a landslide law as the fundamental measures including the promotion of landslide prevention works, restrictions on landslide-inducing activities and house relocation.

Landslide prevention measures had already been taken for sabo, forest conservation and farmland conservation projects based on the Sabo Law, Forest Law, etc. However, measures for landslides in

Photo 21: Yamato River new channel excavation [forecited 16)]

urban fringes, which were difficult to implement with sabo from a flood-control viewpoint as mentioned in the Sabo Law, could not be taken with sabo projects, and the Landslide Prevention Law for the purpose of comprehensive landslide measures was therefore issued on March 31, 1958 as Law No. 30 and went into effect on April 1 (Figure 10).

Article 2 of the act defines the term landslide as a phenomenon in which part of the land flows due to groundwater etc. or moves following a slide.

Section 5. Landslide control projects

Landslide control projects can be classified by operating body into those under the direct management of the national government and those subsidized and executed by prefectures. The system of landslide control projects currently implemented is shown in Table 4.

(1) Landslide control projects under direct management

Article 10 of the act provides that the competent minister may execute landslide prevention works at his/her own discretion if any of the following conditions apply and such works are recognized as particularly important for the conservation of land:

- In the case the scale of landslide prevention works is particularly large
- In the case the landslide prevention works require high technology
- In the case the landslide prevention works need to be executed using high mechanical force
- In the case the landslide prevention works extend over the boundary of prefectures

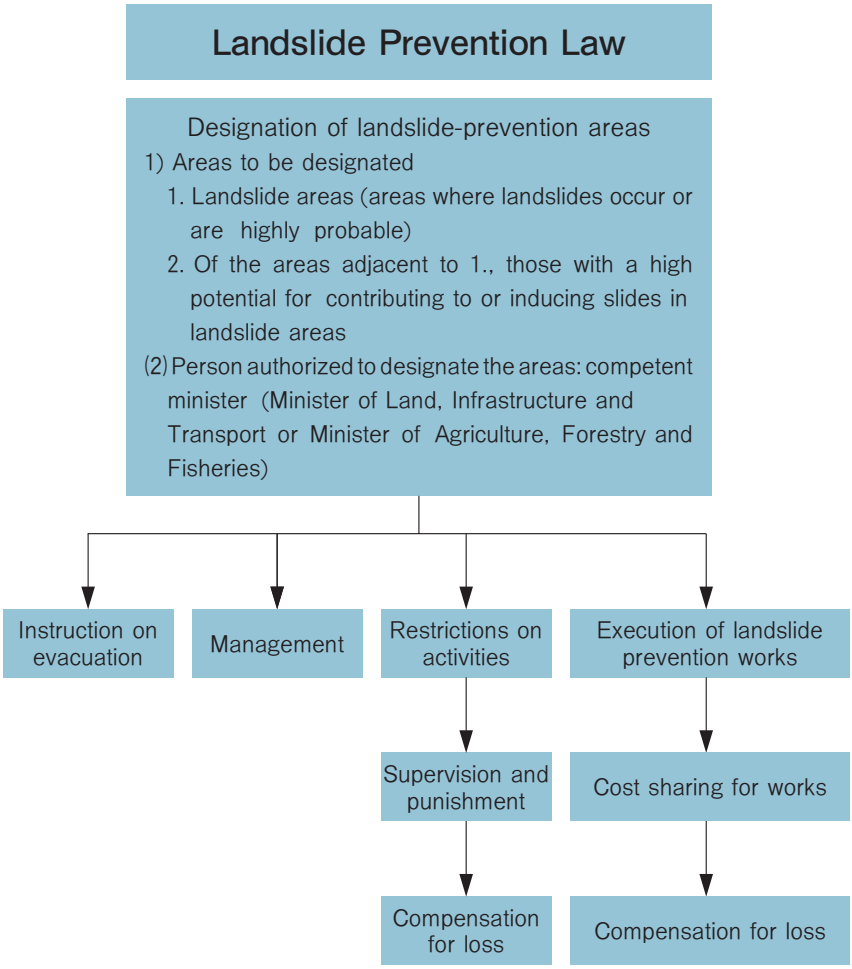


Figure 10 : Concept of the Landslide Prevention Low

Table 4 : System of Landslide Control

	Purpose		Project name
Directly managed	Disaster prevention	Landslide area	Landslide control project under direct management
			Landslide monitor model project
		Regional development	Safe community model project
			Mizube no gakko (waterfront school) project
			Specified slope conservation project
			Specified groundwater-related landslide control projects
		Environmental development	Project for creating green belts on urban hillside
	Disaster measure	Disaster area	Disaster-related emergency project for landslide control under direct management
Subsidized	Disaster prevention	Landslide area	Landslide control project Landslide monitor model project
		Regional development	Safe community model project
			Mizube no gakko (waterfront school) project
			Specified slope conservation project
			Specified groundwater-related landslide control projects
			Rivers and related public facilities improvement project
		Environmental development	Profect for creating green belts on urban hillside
		Non-structural development	Emergency improvement of the information basework
			Development project for interactive, sediment-related disaster information reporting system
			Sabo-related basic investigation
	Disaster measure	Disaster area	Disaster-related emergency project for landslide control
			Special emergency project for severe landslide
			Specified emergency landslide control project

Landslide control measures are executed by the Forestry Agency when the land concerned is forestland and by the Ministry of Agriculture, Forestry and Fisheries when the land concerned is farmland. Accordingly, the Ministry of Land, Infrastructure and Transport executes the works in other cases. The competent minister is the Minister of Land, Infrastructure and Transport and Minister of Agriculture, Forestry and Fisheries.

On April 20, 1962, the first landslide control project under the direct management of the national government was commenced in Jinnosukedani in the Tedori River System (Shiramine, Hakusan City, Ishikawa Prefecture). Since then, projects have been implemented in places such as Kamenose in the Yamato River System (Kashiwara City, Osaka Prefecture) and Toyomaki in the Mogami River System (Yamagata Prefecture) (Figure 11, Table 5).

In 2005, another new landslide control project under the direct management was started in the Yui Area (Yui Town, Shizuoka Prefecture), which is an especially important area in terms of national land conservation with Japan's main arteries running through it including the JR Tokaido Line, National Route 1 and the Tomei Expressway. The project is implemented for the promotion of measures in preparation of the possible occurrence of the Tokai-Tonankai earthquake, which is said to possibly strike anytime, in addition to measures for landslides due to heavy rain (Photo 22).

As with disaster-related emergency sabo projects under the direct management of the government, there are disaster-related emergency projects for landslide control under direct management that are applied to landslides which occurred in the year concerned, which are intended for the conservation of national land and

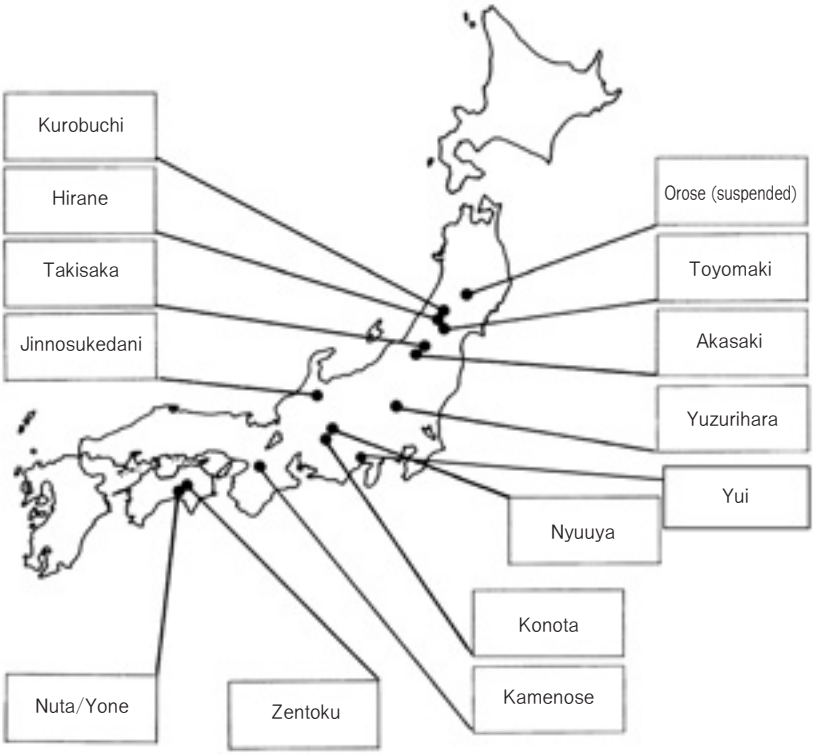


Figure 11: Sites of landslide control projects under the direct management of the government [forecited 11)]

Table 5 : Sites of Landslide Projects Under the Direct Management of the Government [forecited 10)]

Area name	Water system	Prefecture	Size of landslide prevention area (ha)	Start date
Toyomaki	Mogami River	Yamagata	594	Sep. 15, 1962
Hirane	〃	〃	302	Mar. 4, 1972
Kurobuchi ＊	〃	〃	97	Sep. 7, 1979
Orose	Kitakami River	Iwate	345	Jun. 8, 1963
Yuzurihara	Tone River	Gunma	100	Feb. 22, 1996
Akasaki	Agano River	Niigata	53	Apr. 3, 1981
Jinnosukedani	Tetori River	Ishikawa	503	Apr. 20, 1962
Takisaka	Agano River	Fukushima	150	Sep. 17, 1996
Nyuuya	Tenryu River	Nagano	38	Apr. 8, 1988
Konota	〃	〃	88	Apr. 8, 1988
Yui	Terasawa River	Shizuoka	58	Apr. 1, 2005
Kamenose	Yamato River	Osaka / Nara	85	Jun. 1, 1962
Zentoku	Yoshino River	Tokushima	221	Apr. 6, 1982
Nuta / Yone	〃	Kochi	411	Apr. 6, 1982

＊Start date is the date of the public notice as mentioned in Article 10 of the Landslide Prevention Act.
＊Works under the direct management were completed in fiscal 2004 in the Kurobuchi Area.

Photo 22 : Full view of the Yui Landslide [19)]

stabilization of people's livelihood by conducting countermeasure works within the same year.

(2) Subsidized landslide control projects

Old records show that landslide prevention works were executed in Nagano Prefecture in 1886 independently by the prefecture. Since the enactment of the Sabo Law in 1897, landslide prevention works have been conducted as sabo projects in areas specified as designated sediment control areas from a flood-control viewpoint. Subsequently, the frequency and extent of damage due to landslides tended to increase in many parts of Japan; to cope with this landslide control project expense was budgeted in the sabo project expenses in 1937.

In 1952, landslide control projects were established as subsidized projects under Article 16 of the Local Finance Law. As a result, the scope of works covered was extended from those implemented from a flood-control viewpoint to include those that might have major impact on society or the economy irrespective of flood control.

The enactment of the Landslide Prevention Law in 1958 enabled the establishment of subsidized landslide control projects based on law. The concepts of disaster-related emergency projects for landslide control, special emergency projects for severe landslides, specified emergency landslide control projects, emergency improvement of the information baseworks and development projects for interactive, sediment-related disaster information reporting systems are the same as for sabo projects.

a) Specified slope conservation projects (directly managed/ subsidized/steep slope)

These projects are intended for ensuring the safety of landslide areas or steep slopes and maintaining coordination with other public projects to transform slopes and landslide areas into new environmental spaces (**Figure 12**).

b) Specified groundwater-related landslide control projects (directly managed/subsidized)

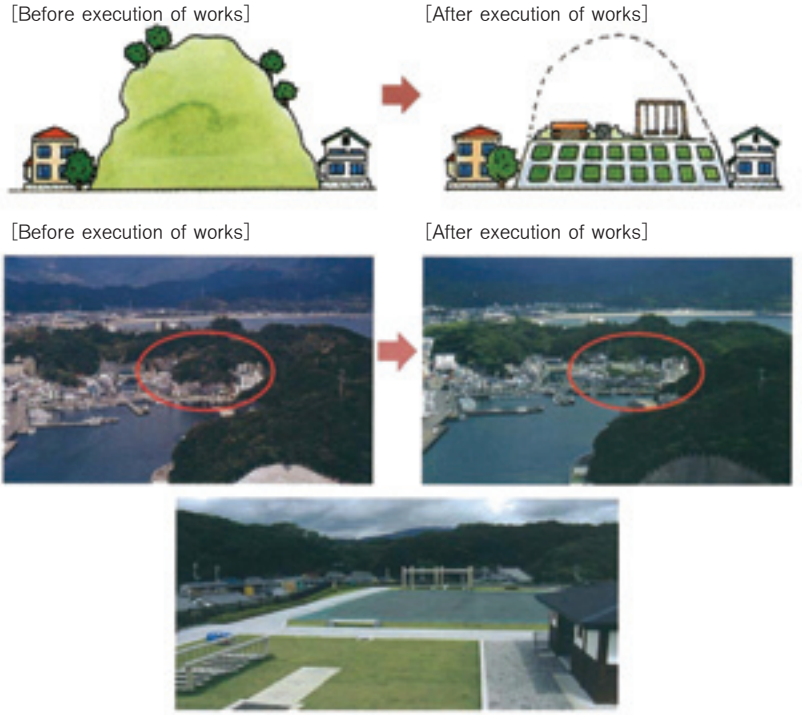
These projects are meant to contribute to the revitalization of communities by utilizing water generated by landslide prevention works including drainage tunnels, drainage wells and boring works as drinking water, and water for domestic use, snow melting liquid, etc.

Section 6 . Slope failure prevention

(1) Beginning of slope failure prevention projects

On the slopes of mountains after a front accompanying a typhoon or rainstorm has passed, denuded section of land resembling a scar can be found. When the population was smaller than now, such oral information concerning disasters passed down from generation to generation was reflected in the lives of people. People who never lived in areas subject to direct impact of collapsed soil were aware that such soil from destroyed areas fell into rivers, and caused the raising of riverbeds downstream.

While shrines, temples and long-standing houses were located in safe areas, the progress of civilization and the development of industry led to a population explosion in Japan. Japan's national land accounts for only 0.3 percent of the global total of national land area, and of this limited area as much as 3/4 is occupied by mountains and hills. The amount of land was not adequate enough to accommodate the population increase and some people were forced to live in



Evacuation space and park area provided (Shiinoura, Nachikatsuura Town, Higashimuro County, Wakayama Prefecture)

Figure 12 : Conceptual drawing of specified slope (steep slope) conservation project [forecited 17)]

mountainous regions which pose danger. The influence of this manifested itself as earthfall disasters. In particular, the concentration of population into urban areas in the high-growth period encouraged the development of new residential areas in piedmonts near urban areas and accelerated the repetition of slope failure.

Measures for slope failure, which directly cause damage to human life and occur suddenly and instantaneously, were strongly called for by various sectors. In response to this background, it was decided in 1967 that 1/2 of the expense for slope failure prevention works executed by prefectures would be subsidized by the national government under the budget support system.

(2) Law for Prevention of Disasters due to collapse of Steep Slopes

It was impossible to cover all of the fundamental measures for slope failure via the implementation of slope failure prevention projects alone.

Slope failure, which was not applicable under both the Sabo Law and the Landslide Prevention Law, needed to be separately defined and dangerous slopes for slope failure also needed to be identified. Concerning such dangerous slopes, regions where harmful activities were conducted inducing slope failure required definition, areas that could be damaged by slope failure needed to be identified, and restrictions on harmful activities, relocation of houses, establishment of warning and evacuation systems, etc. were also necessary to be carried out. In addition to these measures, adequate slope failure prevention measures needed to be taken in the execution of slope failure prevention works. The establishment of a system of law to facilitate all these was therefore required.

In July 1967, a tropical low pressure system, which was Typhoon No. 7, weakened, stimulating the stationary seasonal rain front. It moved from west to east over the two days from the 8th to the 9th from the northwestern part of Kyushu through the Chugoku to Kinki Regions and caused heavy rainfalls in Nagasaki, Saga, Hiroshima and Hyogo Prefectures. Subsequently, the stagnation of the rain front resulted in downpours in Niigata and Toyama Prefectures between August 10 and September 13 and Typhoon No. 34 also caused heavy rainfall in Wakayama Prefecture at the end of October. The rainfalls both comprised locally severe rainstorms with a maximum daily precipitation of over 300mm and brought about serious damage.

In this year, sediment-related disasters caused 455 deaths including 92 in Rokko, Hyogo Prefecture and 88 in Kure City, Hiroshima Prefecture (**Photos 23 and 24**).

In response to successive slope failure disasters, the Ministry of Construction conducted an emergency investigation in the same year on slopes subject to failure, which showed that there were 7,400 such slopes nationwide (the number has now greatly increased as with debris flow torrents, along with improvements in investigation techniques and accuracy in addition to the concentration of population, as shown in **Figure 13**).

In this way, the slope failure in Kobe and Kure Cities, etc. in 1967 led to the enactment of the Law on Prevention of Disasters due to Collapse of Steep Slopes, commonly known as the Steep Slope Law, on July 1, 1969 (**Figure 14**).

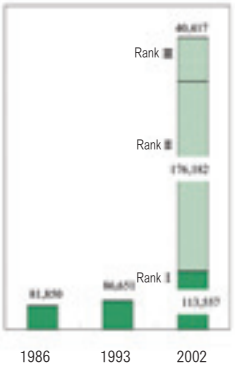
Regarding the purpose of the law, it states that the law "is aimed at taking measures required for the prevention of slope failure to protect

Ichigahara today

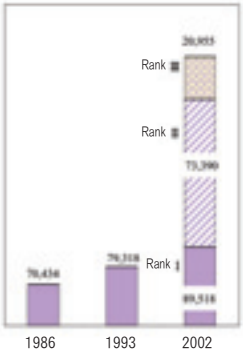
Ichigahara Collapse
(Ichigahara, Yamagori, Chuo Ward)

Photo 23 : Slope failure in Kobe City (July 1967)[20]

Photo 24 : Slope failure in Kure City (July 1967; Kegoya 8-chome)[21]



Number of dangerous slopes for slope failure

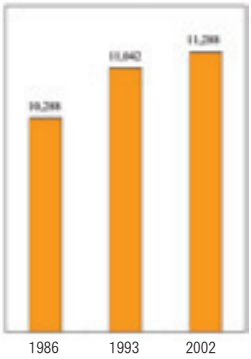


Number of debris flow torrent

Rank I: an area with 5 or more houses to protect

Rank II: an area with 1-4 houses to protect

Rank III: an area currently with no houses to protect that may become a hazard area in the future



Number of potential landslide site

Figure 13 : Number of dangerous spots for sediment-related disasters forecited 10)

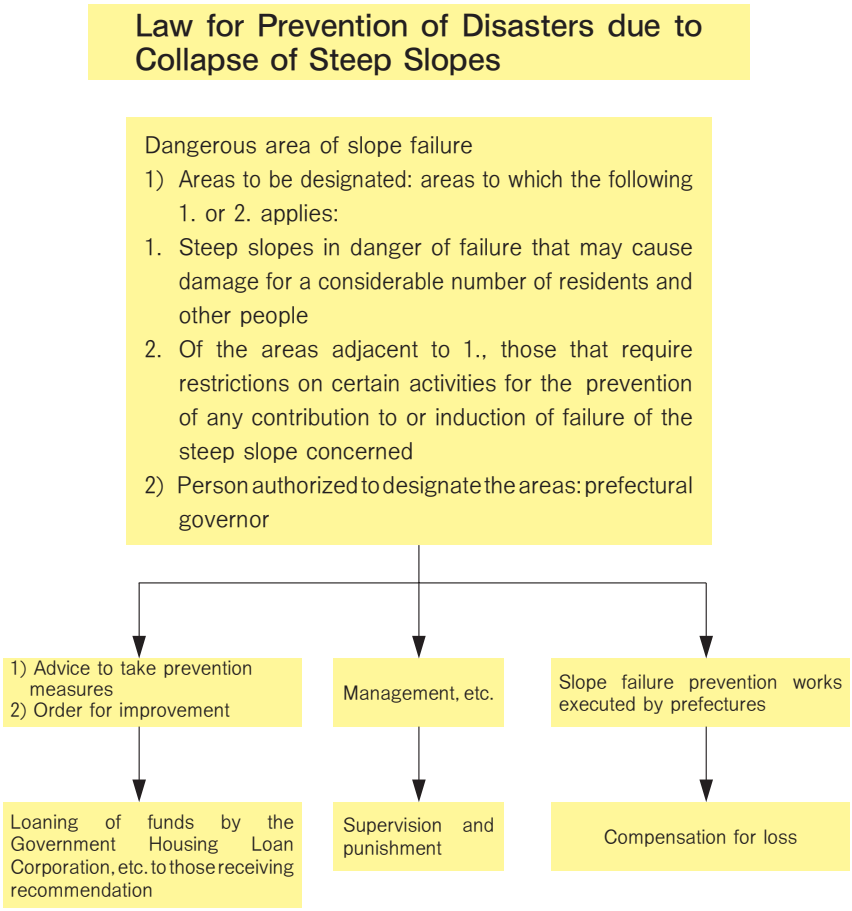


Figure 14 : Concept of the Law for Prevention of Disasters due to Collapse of Steep Slopes

people from disasters caused by slope failures, thereby contributing to the stabilization of people's lives and the conservation of national land."

Among the vast number of laws, there are not many which clearly mention as their purpose the protection of people's lives.

In Article 2, a steep slope is defined as a slope with an inclination of at least 30 degrees. Article 9 states that the party under obligation to conserve and maintain a slope is primarily the owner, manager or occupant of the land and secondly the party that may suffer damage from slope failure should take measures to remove or mitigate damage from failure.

Regarding slope failure prevention works, Article 11 provides that, when it is recognized as difficult or inappropriate for the owner, manager or occupant of the steep slope or the party who may suffer damage to implement the works, the governor of the prefecture concerned should execute the works.

In either case, the area concerned must be designated as a dangerous area for slope failure under Article 3 of the law. In reality, however, it is difficult to gain the understanding of the potentially affected residents by area designation alone and the designation is usually on the premise of slope failure prevention works.

Section 7. Slope failure prevention projects

Slope failure prevention projects are conducted by prefectures. The system of the projects is shown in Table 6.

Table 6 : Slope Failure Prevention Projects

	Purpose		Project name
Subsidized	Disaster prevention	Steep slope	Slope failure prevention project
			Slope failure prevention project including evacuation related measures
			Project for emergency reconstruction of steep slope failure prevention facilities
		Avalanche control	Avalanche control project
			Comprehensive avalanche control model project
		Regional development	Safe community model project
			Specified slope conservation project
			Rivers and related public facilities improvement project
			Project for improvement of specified flood control facilities for housing and building land development
		Environmental development	Project for creating green belts on urban hillside
		Non-structural development	Emergency improvement of the information basework
			Development project for interactive, sediment-related disaster information reporting system
			Sabo-related basic investigation
	Disaster measure	Disaster area	Disaster-related emergency project for slope failure prevention
			Special disaster-related emergency project for slope failure prevention
			Disaster-related emergency project for avalanche control
			Slope failure control project for disaster-related areas
			Slope failure prevention project in disaster-stricken forests

(1) Slope failure prevention projects

Along with the enactment of the Steep Slope Law, slope failure prevention projects under the government subsidy system began.

The criteria for the adoption of projects intended for protecting people from disasters due to slope failures have changed as shown in Tables 7 and 8 according to the actual conditions of disasters and social circumstances.

Under Article 23 of the law, prefectures may charge the party that will considerably benefit from slope failure prevention works with part of the expense of the works as the payment by beneficiary, the percentage of which is shown in Table 9.

a) Disaster-related emergency projects for slope failure prevention

These projects are intended for urgently implementing slope failure prevention works when new slope failures generated by typhoon and flood damage or earthquakes may, if left untreated, create damage by possible subsequent rainfall and are similar to those for sabo and landslide control projects.

b) Special disaster-related emergency projects for slope failure prevention

In a group of areas that suffered intensive slope failures, slope failure prevention works for adjacent slopes subject to slope failure are implemented in an integrated manner with a disaster-related emergency projects for slope failure prevention.

c) Slope failure control projects for disaster-related areas

These projects are implemented for areas that may be affected by a serious disaster that occurred in the year concerned and is included in the dangerous slopes for slope failure mentioned in the municipal plans for disaster prevention that may, if left untreated, cause

Table 7 : Change in Criteria for Adoption [forecited11)]

Fiscal year	Subsidy for slope failure prevention project			Subsidy for investigation for slope failure prevention project	Subsidy for steep slope basic investigation
	Subsidy for steep failure prevention project	Emergency improvement of the information basework	Development project for interactive, sediment-related disaster information reporting system		
	Total project cost (million yen)	Total project cost	Total project cost	Total project cost	Total project cost
1967–1979	5 or more	–	–	–	
1980–1988	15 or more	–	–	–	–
1989–1992	General: 15 or more Evacuation-related: 30 or more	–	–	–	–
1993	General: 15 or more Evacuation-related: 30 or more Stricken forest: 30 or more	–	–	–	–
1994	General: 30 or more Evacuation-related: 50 or more Stricken forest: 30 or more	–	–	–	–
1995	General: 35 or more Evacuation-related: 60 or more Stricken forest: 35 or more Disaster-challenged: 35 or more	–	–	–	–
1996	General: 40 or more Evacuation-related: 70 or more Stricken forest: 40 or more Disaster-challenged: 40 or more	None	–	–	–
1997–1999	General: 70 or more Evacuation-related: 80 or more Stricken forest: 70 or more Disaster-challenged: 70 or more	〃	–	–	–
2000	〃	〃	None	None	–
2001–	〃	〃	〃	–	None
Year of establishment	1967	1996	2000	2000	2001

Table 8 : Change in the Number of Houses as a Criterion [forecited11)]

Classification	General project		Emergency project		Disaster-related emergency project	
	Height (m)	No. of houses to protect	Height (m)	No. of houses to protect	Height (m)	No. of houses to protect
1967–1971	10	50	10	30		
1972–1974	〃	20	〃	10		
1975	〃	〃	〃	5		
1976–1979	〃	10	〃	〃		
1980–1982	〃	〃	(5) 10	〃		
1983–1986	〃	〃	〃	〃	(5) 10	5
1987–1988	〃	〃			〃	〃
1989–1992	〃	[5] 10			〃	〃
1993–1994	〃	[5] 10 〈5〉			〃	〃
1995	〃	[5] 〈5〉 《5》 10			〃	〃
1996	〃	[5] 10 〈5〉 {5} 10			〃	〃
2000	〃	[5] 10 〈5〉*1 {5}			〃	〃

[ ] for evacuation-related slope failure prevention projects
〈 〉 for slope failure prevention projects in disaster-stricken forests
( ) for cases where houses, etc. were damaged
《 》 for slope failure prevention projects concerning facilities for people requiring support in the event of disaster
{ } for slope failure prevention projects concerning evacuation areas
*1: converted based on the house capacity of three persons

Table 9 : Percentage of Payment by Beneficiary (as of fiscal 1999) [forecited 11)]

Classification		Percentage of payment by beneficiary	
		General project	Disaster-related emergency project
General	Large slope *	10%	10 (5)%
	Emergency improvement *	10%	—
	Disaster follow-up *	20 (10)%	—
	Other	20%	20 (10)%
Public-related* Evacuation-related* Disaster-challenged*	Large slope *	5%	(2.5)%
	Emergency improvement *	5%	—
	Disaster follow-up *	10%	(5)%
	Other	10%	10 (5)%

( ) for cases where partially-destroyed structure or more serious damage was observed

* "Public-related" refers to cases where there are facilities to which any of the following applies in the areas prone to damage caused by slope failure (areas subject to damage):
- River as mentioned in (1) and sabo facilities in (3) of Article 3 of the Act Concerning National Treasury Share of Expenses for Recovery Projects for Public Civil Engineering Facilities Damage due to Disasters
- Expressway as mentioned in (1), general national road in (2), prefectural road in (3) or municipal road in (4) of the Road Law without arterial municipal road or detour.
- Railroad facilities as provided for in Article 8-1 of the Railway Business Law or track as provided for in Article 1-1 of the Tramway Law
- Waterworks facilities as provided for in Article 3-8 of the Water Supply Law except for distribution pipes of water distribution facilities as provided for in (6) of Article 5-1 of the law.

* "Evacuation-related" refers to cases in which evacuation route or area specified in the local disaster prevention plans of municipalities is provided in an area prone to damage caused by slope failure.

* "Disaster-challenged" refers to cases in which child welfare facilities, welfare facilities for the elderly, rehabilitation facilities for the physically disabled, welfare facilities for the mentally retarded, medical care facilities or kindergartens are in an area prone to damage caused by slope failure.

* "Large slope" refers to a slope with a general height of at least 30m.

* "Emergency improvement "refers to renovation of slope failure prevention facilities constructed with subsidy under Article 21 of the Law for Prevention of Disasters due to Collapse of Steep Slopes in an area prone to slope failure as provided for in Article 3 of the act that have impaired disaster prevention functions.

* "Disaster follow-up" refers to works to be implemented in an area for which a disaster-related emergency project has been adopted (except for an area treated as a large slope) within about two years after the adoption (the following year and the year after).

damage to two or more houses.

d) Projects for emergency reconstruction of slope failure prevention facilities

If any of the existent slope failure prevention facilities may, if left untreated, cause significant damage due to functional impairment, etc. or is not consistent with the surrounding environment, a reconstruction project is implemented.

(2) Avalanche control projects

These projects were started in 1985 and are intended for conducting avalanche control works for the protection of settlements in the heavy snowfall areas designated under Article 2 of the Law of Special Countermeasures for Heavy Snowfall Area.

Section 8. Sediment-Related Disaster Prevention Law

On June 29, 1999, an intensive rainstorm hit a region stretching from Hiroshima to Kure City in Hiroshima Prefecture as the seasonal rain front became active. Regarding the precipitation that fell, the total amount of continuous rainfall between 0:00 to 24:00 on the day was 255mm and the hourly amount of rainfall between 14:00 and 15:00 was 63mm according to records taken at the Uokiri Dam observatory. The geology of Hiroshima Prefecture is characterized by widely distributed granite, which becomes brittle if weathered, and the prefecture has the most debris flow torrents and dangerous slopes for slope failure in all of Japan. For this reason, the prefecture has suffered numerous sediment-related disasters since early times. The 1999 incident claimed the lives of 24 people in sediment-related disasters.

Issues identified by the Hiroshima disaster and other recent disasters include:

- Efforts must be made to provide valid information and warning and evacuation systems on a routine basis.
- Facilities to protect vulnerable people from disasters and houses located without regard of security for sediment-related disasters and new residential areas tend to suffer damage, and vulnerable people from disasters account for a large proportion of the total of damage sufferers.
- Considering the low level of the rate of improvement for dangerous spots for sediment-related disasters (20 percent) and the vast number of dangerous spots that exist, improvement requires substantial budgetary amounts and a long period of time. In addition, the number of improved areas exceeds that of new dangerous spots every time the list of dangerous spots is revised.

Issues concerning the current system include:
- Whether a given place of residence is subject to sediment-related disasters or not is unclear.
- Location restriction policies by restricting housing land development or construction in areas in danger of sediment-related disasters are not sufficient.

With these challenges and issues taken into consideration, the Committee for Study of Systems under the Sediment-Related Disaster Prevention Law established by the Ministry of Land, Infrastructure and Transport presented the suggestions as follows:
- Designation of sediment-related disaster warning areas (areas subject to sediment-related disasters) and warning and evacuation systems should be improved.
- Location restriction policies, etc. should be implemented in special sediment-related disaster hazard areas (of the sediment-related disaster warning areas, those prone to cause significant damage to

the lives and physical health of residents, etc. in the event of sediment-related disaster).
- Basic investigations concerning sediment-related disasters should be conducted.
- Guidelines for the prevention of sediment-related disasters should be drawn up.

After the Hiroshima disaster, the Law related to Promotion of Measures for Sediment-related Disaster Prevention in a Restricted Area etc. Due to Sediment-related Disaster (Sediment-Related Disaster Prevention Law) was enacted as Law No. 57 on May 8, 2000 with the suggestions of the committee taken into consideration, which is significant in the following respects:
- The law has no provision on works as structural measures for the prevention of sediment-related disasters but is intended to protect residents from sediment-related disasters by non-structural measures including the improvement of warning and evacuation systems, etc.
- While the existing laws concern areas that may cause disasters (sources), this law has its focus on areas that suffer damage in disasters.
- From the viewpoint of prevention of damage, this law goes hand in hand with development permission and building certification systems.
- This law expects synergy between "efforts to provide awareness" by the government and "efforts to become aware" by residents.

In 2005, based on the lessons learned from the 2,537 sediment-related disasters that occurred in the previous year, the act was partially amended to further improve the warning and evacuation systems in sediment-related disaster warning areas. The amendment includes

the following two points:

- Information including methods of communication for sediment-related disaster information and evacuation areas shall be provided for residents to keep them fully informed using hazard maps, etc.
- The methods of communication regarding sediment-related disaster information provided to facilities mainly used by the elderly, infants, etc. in sediment-related disaster warning areas shall be stipulated in the municipal plans for disaster prevention.

It must be remembered that, unfortunately and regretfully, sabo administration and study have made progress based on the ultimate sacrifice of many lives, which is shown in the transition of sabo administration (**Figures 15 and 16, Table 10**).

Section 9. Comprehensive river basin disaster prevention projects

These projects were established in 2005 and are aimed at implementing sediment-related disaster prevention, flood disaster prevention and structural/non-structural measures in an integrated manner in a river basin as a whole. Projects are implemented for the individual basin in principle. For improved autonomy and discretion of regional governments, projects concerning the development of facilities with small scales of operation (sabo, landslide control, slope failure prevention or avalanche control facilities) and non-structural measures such as the provision of disaster-related information (information infrastructure or development projects for interactive, sediment-related disaster information reporting systems) are subsidized collectively for prefectures to carry out according to the conditions of the river basins concerned. The criteria for the adoption or nature of the individual projects do not change.

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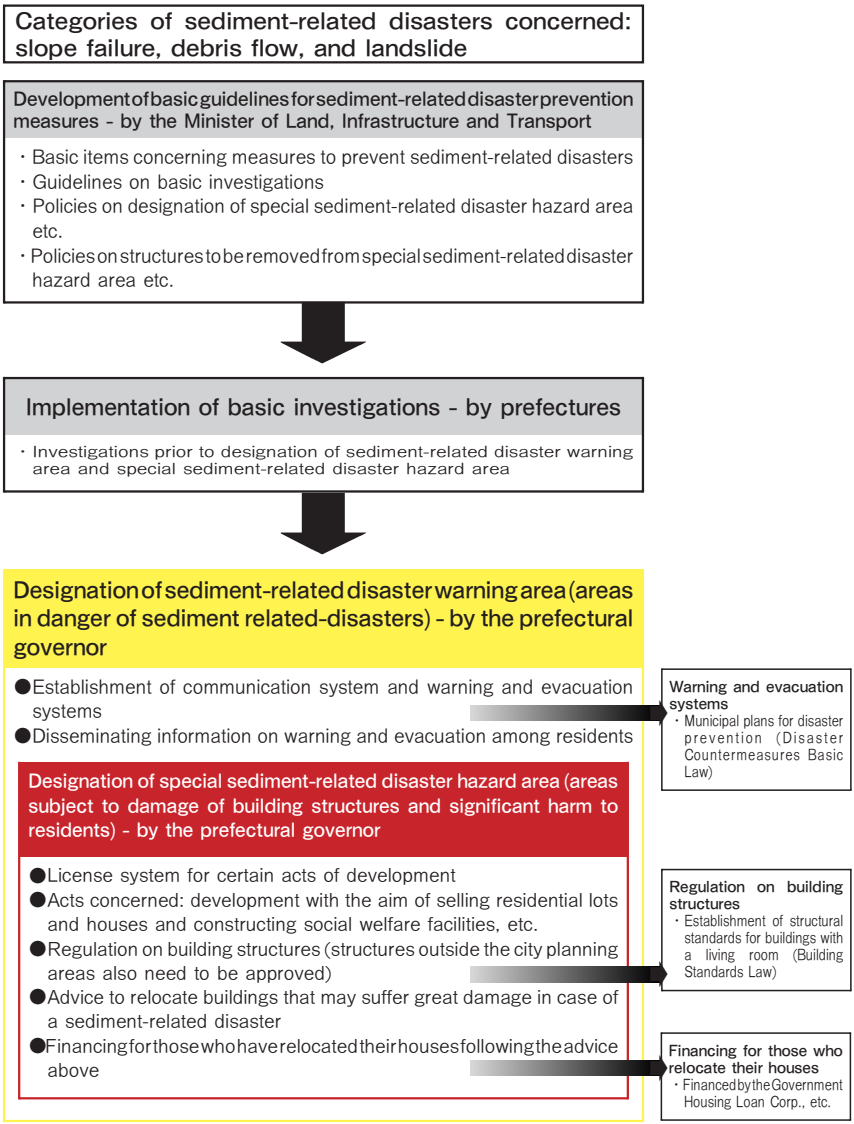
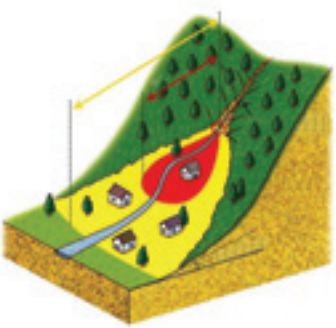
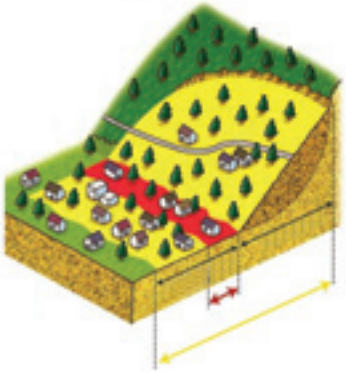


Figure 15 : Concept of the Sediment-Related Disaster Prevention Law [22)]

[Debris flow]



[Landslide]



[Slope failure]

Figure 16 (1) : Concept of designation of warning areas [forecited 22)]

Measures taken in warning areas

Establishment of warning and evacuation systems
To protect human life from sediment-related disasters, a warning and evacuation system is established for faster communication of disaster information and evacuation orders. (Municipalities)

Regulation on building structures
Buildings with a living room are subject to building certification to ensure the safety of the structure against assumed impact. (Local public authorities with building officials)

Further measures taken in hazard areas

License system for certain acts of development
Development with the aim of selling residential lots and houses and constructing social welfare facilities, etc. is permitted only if it meets the criteria. (Prefectures)

Relocating buildings
Advice to relocate houses, etc. is given to the owners, etc. of buildings that may suffer great damage. (Prefectures)

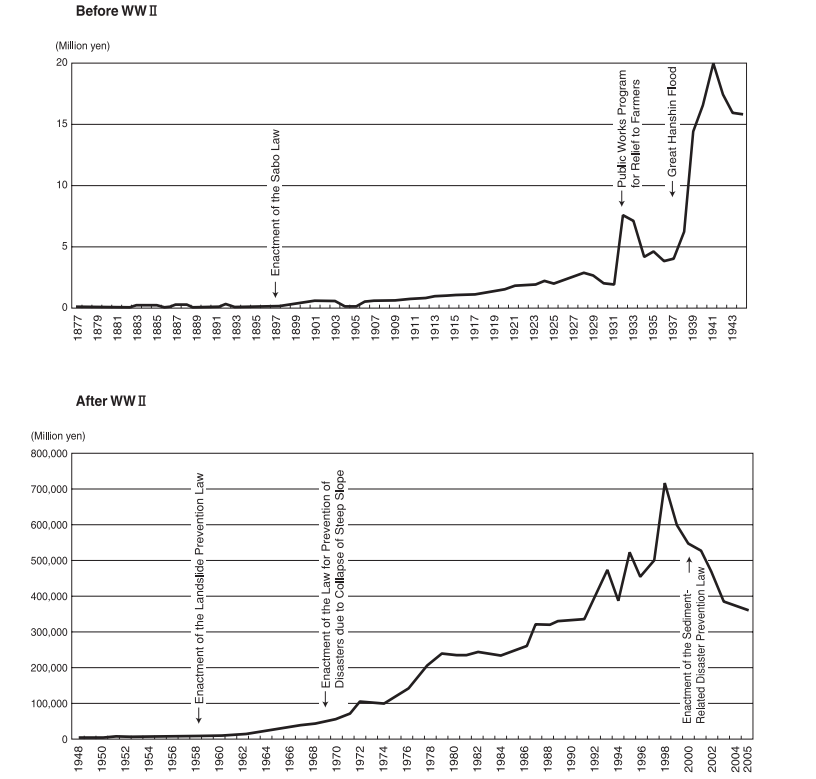
Figure 16 (2) : Concept of designation of warning areas [forecited 22)]

Table 10 : Designation of Sediment-Related Disaster Warning Areas, etc. in Japan (as of Mar 31, 2007) forecited 10)

Prefecture	Debris flow		Slope failure		Landslide		Total	
		Of those, special areas		Of those, special areas		Of those, special areas		Of those, special areas
Hokkaido	2	2	48	46	0	0	50	48
Aomori	237	146	748	682	0	0	985	828
Iwate	273	201	307	298	0	0	580	499
Miyagi	112	80	74	73	0	0	186	153
Akita	236	0	273	0	0	0	509	0
Yamagata	211	149	90	89	0	0	301	238
Fukushima	161	101	175	170	0	0	336	271
Ibaraki	69	62	164	153	0	0	233	215
Tochigi	545	393	721	701	12	0	1,278	1,094
Gunma	65	62	101	97	0	0	166	159
Saitama	96	75	249	155	0	0	345	230
Chiba	0	0	24	24	0	0	24	24
Tokyo	106	0	248	0	1	0	355	0
Kanagawa	37	29	24	0	0	0	61	29
Yamanashi	360	285	529	522	59	0	948	807
Nagano	1,314	1,118	2,860	2,518	0	0	4,174	3,636
Niigata	224	47	198	33	43	0	465	80
Toyama	132	79	321	304	45	0	498	383
Ishikawa	127	113	13	13	1	0	141	126
Gifu	401	332	0	0	0	0	401	332
Shizuoka	193	99	489	266	0	0	682	365
Aichi	52	43	139	132	0	0	191	175
Mie	12	0	5	0	0	0	17	0
Fukui	1,759	1,324	1,507	1,442	0	0	3,266	2,766
Shiga	531	189	655	514	0	0	1,186	703
Kyoto	84	59	171	162	19	0	274	221
Osaka	0	0	332	332	0	0	332	332
Hyogo	419	0	646	0	0	0	1,065	0
Nara	33	0	130	0	0	0	163	0
Wakayama	8	8	7	0	0	0	15	8
Tottori	998	0	1,272	2	0	0	2,270	2
Shimane	4,129	0	6,618	0	0	0	10,747	0
Okayama	429	34	543	40	0	0	972	74
Hiroshima	1,164	961	1,699	1,654	0	0	2,863	2,615
Yamaguchi	20	0	15	0	0	0	35	0
Tokushima	38	0	19	0	0	0	57	0
Kagawa	97	0	15	0	0	0	112	0
Ehime	258	222	84	84	0	0	342	306
Kochi	315	0	624	0	0	0	939	0
Fukuoka	5	5	6	0	0	0	11	5
Saga	1	0	2	0	0	0	3	0
Nagasaki	101	80	313	300	0	0	414	380
Kumamoto	368	280	106	104	0	0	474	384
Oita	97	81	166	165	0	0	263	246
Miyazaki	31	0	160	0	0	0	191	0
Kagoshima	1,610	70	3,190	122	0	0	4,800	192
Okinawa	0	0	2	0	0	0	2	0
Total	17,460	6,729	26,082	11,197	180	0	43,722	17,926

Chapter 6 : Transition of Project Expenses

The transition of project expenses since the start of sabo projects is shown in **Figure 17**.



Note: Sabo-related project expenses mean the total of the final amount of expenses for sabo, landslide prevention and steep slope failure prevention projects, etc. under the direct management of the government or with subsidies.

Figure 17 : Transition of sabo projects forecited 10)

Chapter 7 : Transition of Organization

Section 1. Edo period

As in the Regulations of Mountains and Rivers of 1666, the Shogunate Government applied stringent controls on the management of mountains. For organizations to implement sediment control works in the Yodo River Basin that suffered especially frequent disasters, the Shogunate appointed in 1689 the three clans Yanagisawa of Yamato, Todo of Iga, and Inaba of Yodo, as doshadome bugyo and constables under four town magistrates in Kyoto and Osaka as doshadome kata to accomplish the task.

Also in regional domains, supervision of mountains was conducted as in the Akita Domain, for example, which appointed forest rangers in 1668.

Section 2. Meiji period

Governmental organizations started to become structured from November of 1873, when eight ministries were founded by the reorganization of the government offices. Sabo projects were under the jurisdiction of the Ministry of Home Affairs. The Bureau of Civil Engineering of the Ministry of Home Affairs was established in January 1874, became the Civil Engineering Bureau in January 1877 and the National Land Bureau in September 1941, which ultimately resulted in the dissolution of the Ministry after World War II.

The organization involved in the actual sabo projects was the Flood Control Division of the Ministry of Home Affairs, which had control over:

- Matters concerning works of river levees, harbors, etc. under the direct management of the Ministry

・Supervision of works of river levees, harbors, etc. under the management of prefectures

As the number of works under the direct management increased, the organizational order for civil engineering supervision regions was established in 1886 and the entire country was divided into six regions, each of which was provided with a civil engineering supervision office. Later in 1894, the number of supervision offices increased to seven: Tokyo, Sendai, Niigata, Nagoya, Osaka, Hiroshima and Kumamoto. In addition to the execution of works under the direct management of the government, the supervision offices were authorized by the Civil Engineering Bureau of the Ministry of Home Affairs to conduct supervision operations of prefectural civil engineering works. This system was abolished in March 1905 and prefectural civil engineering works were returned to the charge of the Civil Engineering Bureau of the Ministry. The Civil Engineering Branch Offices were newly established for the execution of works under the direct management of the government. There were four Branch Offices at first, located in Tokyo, Niigata, Nagoya and Osaka. In April 1911 the fifth and sixth Branch Offices were founded in Sendai and Shimonoseki.

Regarding the prefectural organizations, the Local Governments Organization Order was proclaimed by the Imperial decree of July 20, 1886, which provided that the Civil Engineering Division of the Second Department should take charge of civil engineering works under the departmental system adopted. This organization order underwent a major revision in 1890 and the prefectural organization adopted a system with the governor's secretariat and two departments, namely the Home Affairs and Police Affairs Departments, and the civil engineering operations came under the charge of the Civil Engineering Section of the Second Division of the

Home Affairs Department.

Section 3. Taisho period

The organization of the Civil Engineering Bureau of the Ministry of Home Affairs included five divisions: the River Division, Port and Harbor Division, Road Division, Engineering Division 1 and Engineering Division 2. Sabo-related operations were conducted by Engineering Division 1.

At the end of the Taisho period, there were eight Civil Engineering Branch Offices in charge of the execution of works under the direct management: Tokyo, Yokohama, Sendai, Niigata, Nagoya, Osaka, Kobe and Shimonoseki.

Section 4. Showa and Heisei periods

To adequately deal with serious sediment-related disasters such as the Great Hanshin Flood in 1938, Engineering Division 3 was founded on August 12 of that year with exclusive competence over sabo works. As a result, the number of divisions in the Ministry of Home Affairs increased from five to six. However, in 1941, the organizational change under the war regime changed the Civil Engineering Bureau to the National Land Bureau, the six divisions into five, namely the General Affairs, Planning (City Planning), River, Road, and Port and Harbor Divisions and the execution of sabo projects came under the management of the River Division.

After World War II, the Sabo Division was restored on November 20, 1945. The new Constitution was proclaimed on November 3, 1946 and went into effect on May 3 of the following year, which involved a significant change in the administrative organization. As the Ministry of Home Affairs was dissolved, civil engineering

administration was placed under the control of the Construction Agency, which was established as an external organ of the Prime Minister's Office, on January 1, 1948. The agency was further changed to the Ministry of Construction on July 10 of that year and the organization was enhanced. The organization at the time of establishment included the Minister's Secretariat, General Affairs, River, Road, City, Construction and Special Construction Bureaus and the River Bureau was composed of five divisions: the Administration, Flood Control, Water Utilization, Sabo and Disaster Prevention Divisions.

In 1962, the Sabo Department was founded in the River Bureau, which only included the Sabo Division. The Landslide Control Office was established in 1970, which consisted of one department, one division and one office. The Landslide Prevention Office became the Slope Conservation Division in 1974 and the organization was changed to include one department and two divisions.

On January 6, 2001, the Ministry of Construction, Ministry of Transport, the National Land Agency and the Hokkaido Development Agency were integrated to form the Ministry of Land, Infrastructure and Transport. Under the Sabo Department, the Sabo Planning Division, Land Conservation Division and Seacoast Division were established and, as the Sediment-Related Disaster Prevention Law went into effect, the Sabo Management Office was formed under the Sabo Department in April 2002, which resulted in an organization with two divisions and two offices.

The number of Civil Engineering Branch Offices was decreased from eight to six in 1943 and the names were changed to geographic designations: namely Tohoku, Kanto, Chubu, Kinki, Chugoku-Shikoku

and Kyushu. The Civil Engineering Branch Offices were placed under the control of the Construction Agency of the Prime Minister's Office after the postwar dissolution of the Ministry of Home Affairs, which, in January 1948, were renamed as the Regional Construction Bureaus. Subsequently the Ministry of Construction was established and in 1958, to cope with the increased number of projects, the Hokuriku Regional Construction Bureau was newly founded in Niigata, the Chugoku-Shikoku Regional Construction Bureau was divided into the Chugoku Regional Construction Bureau in Hiroshima and the Shikoku Regional Construction Bureau in Takamatsu, resulting in eight Regional Construction Bureaus. The Bureaus were also renamed as the Regional Development Bureaus on January 6, 2001 and currently have offices directly under them in charge of 35 sabo projects under the direct management of the government.

In 1927, the Civil Engineering Department was founded in six large prefectures including Osaka. Along with the foundation of Engineering Division 3 in 1938, Sabo Divisions were established the following year for the first time in the seven prefectures of Nagano, Gifu, Toyama, Mie, Kyoto, Hyogo and Hiroshima, which was followed by the establishment of Sabo Divisions in Miyagi, Kanagawa, Niigata and Shizuoka in 1940.

The Local Autonomy Law went into effect at the same time as the enforcement of the new Constitution and the conventional Local Governments Organization Order was abolished. The organization of prefectures was based on the seven-department system with the General Affairs, Civil Administration, Education, Economy, Civil Engineering, Farmland and Police. From 1939, the Sabo Divisions operating in 11 prefectures were gradually abolished

as the war regime strengthened and only three remained after the war, namely those in Miyagi, Kyoto and Hyogo. However, for restoring national land from devastation due to successive major disasters, Sabo Divisions were established one after another.

As of 2005, the names of the departments in charge of sabo have become considerably varied in the recent trend of organizational reform: Sabo Division, River and Erosion Control Division, Erosion Control and Disaster Division, Disaster Prevention and Sabo Division, Sabo Group, Dam and Sabo Office, Sabo and Seacoast Division, Flood Control Sabo Division and Sabo Office (**Figure 18**).

Sediment-related disasters can directly lead to the loss of human life and are very difficult to predict. To counter sediment-related disasters, comprehensive measures must be taken in both structural and non-structural manners.

As frequent intensive rainstorms are anticipated due to global warming and no decrease in the number of sediment-related disasters can be expected, success of the initial response is pivotal in determining the degree of damage and the role of the administration is significant. There are four competent acts regarding sabo and it should be avoided to abolish the independent sabo division to integrate it into another organization with different tasks only for the purpose of offsetting numbers.

The 21st century is a century where safety and the environment are chief concerns, and accordingly the role, responsibility and future expectations of sabo projects are significant. It is important to implement sabo measures that enable the continued use of beneficial national land environment for generations to come, keeping the spirit

of sabo in mind.

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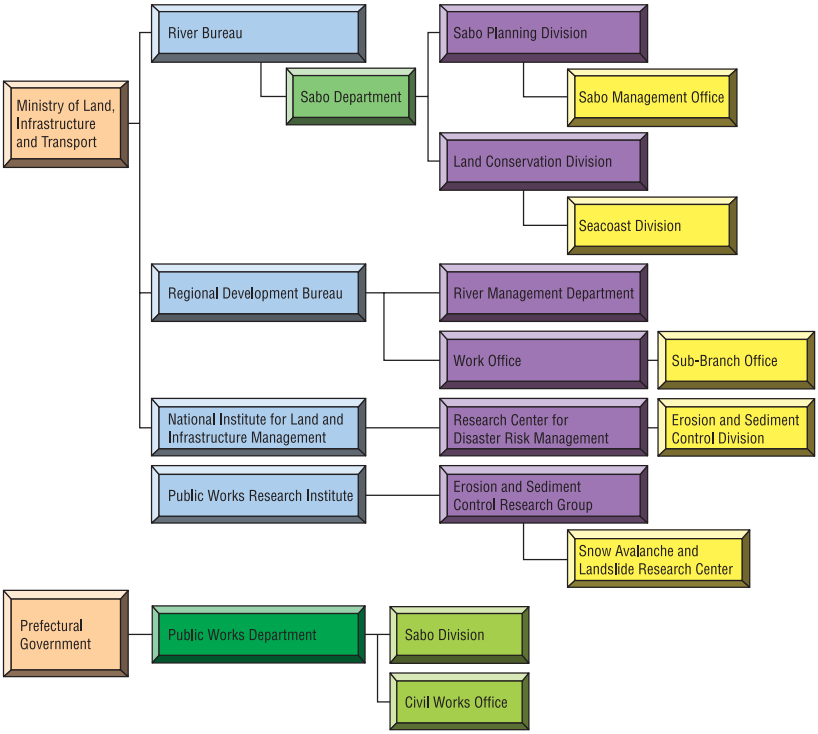

Figure 18 : Sabo-related administrative organization of Japan forecited [17)]

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