JAPAN COMMISSION ON LARGE DAMS
(JCOLD)

INTERNATIONAL COMMISSION ON LARGE DAMS
(ICOLD)

OVERVIEW


Kurobe Dam

Ⅰ. Overview of the Japan Commission on Large Dams (JCOLD)

1. History

In 1931, three years after the International Commission on Large Dams (ICOLD) was established, Japan joined ICOLD as the Japan National Committee on Large Dams. In 1944, Japan withdrew from ICOLD during the World War II, then rejoined in March 1953. On September 13, 1962, the Japan Commission on Large Dams was established, and in January 2012, it became a General Incorporated Association.

2. Operations

JCOLD is involved in operations such as surveys, research, international technology exchanges, etc. concerning large dams and related facilities (below, "large dams"), in order to improve the design, construction, maintenance, and operation of large dams and to contribute to the development of the Japanese economy. Responsibilities include:

Collection of information, surveying, and research concerning large dams

(1) Exchange of technology and guidance concerning large dams

(2) Participation in ICOLD, assistance with its activities, and international exchange of technology concerning large dams

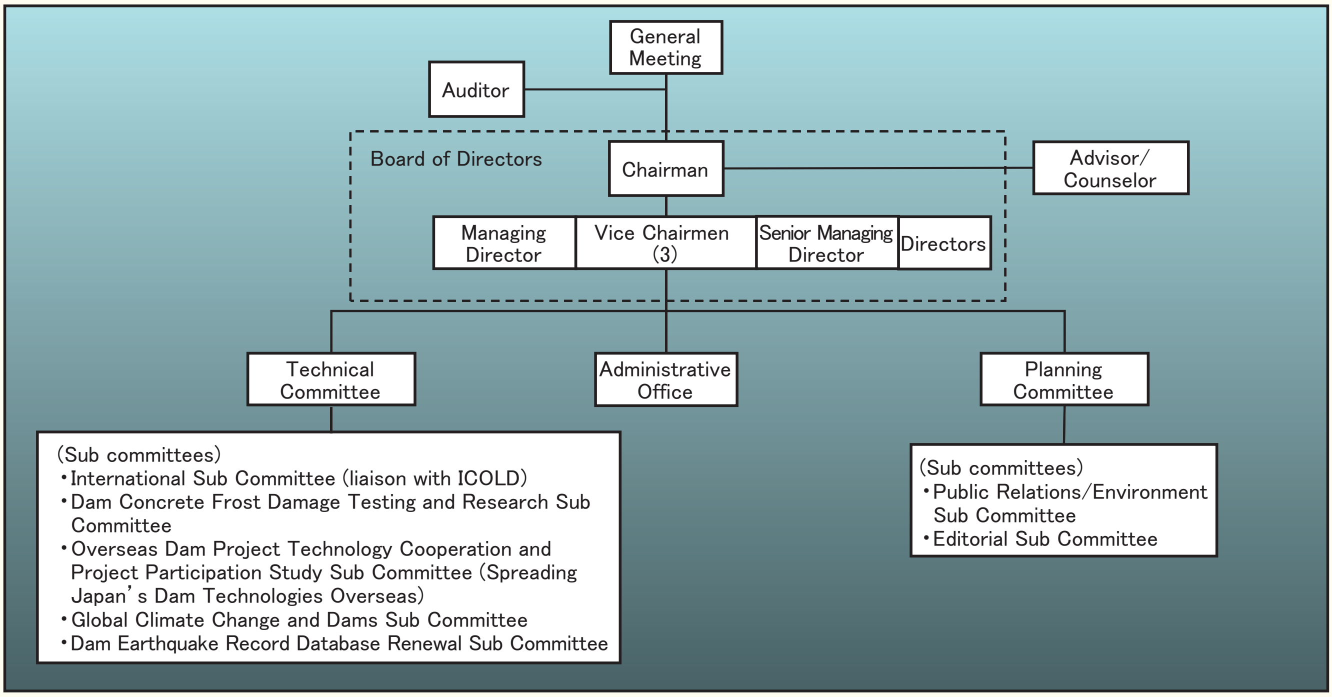
(3) Introduction of and spreading awareness of the achievements of surveys and research concerning large dams

(4) Other activities necessary to achieve the goals of JCOLD

In recent years, JCOLD has actively conducted a program of surveys and research on methods of harmonizing dam development with the environment and on ways to mitigate their environmental impacts to achieve the sustainable development of dams.

3. Organization

Under the leadership of the Chairman, there is a Planning Committee, Technical Committee, and Administrative Office. These committees undertake work in their respective areas.



4. Membership

The members of JCOLD are incorporated bodies involved in dam construction. They include government bodies concerned with dam construction, electric power companies, survey and research bodies, academic associations, industrial associations, construction consultants, construction companies, and manufacturers (72 members as of January 2012).

Ⅱ. Activities

1. Sub committees

The Planning Committee and the Technical Committee have established the following Sub committees to carry out the activities of JCOLD.

(1) Sub Committees of the Planning Committee

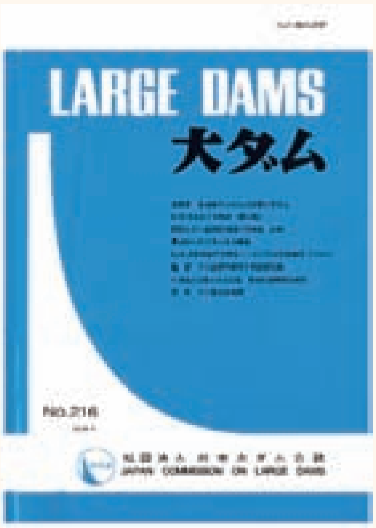
- Public Relations/Environment Sub Committee (Publicizing water management of river basins, roles of reservoirs, etc.)
- Editorial Sub Committee (Editing the JCOLD Journal: *Large Dams*)

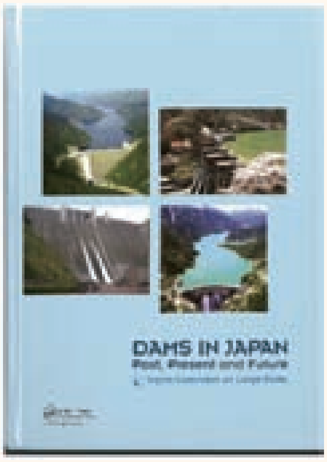
(2) Sub Committees of the Technical Committee

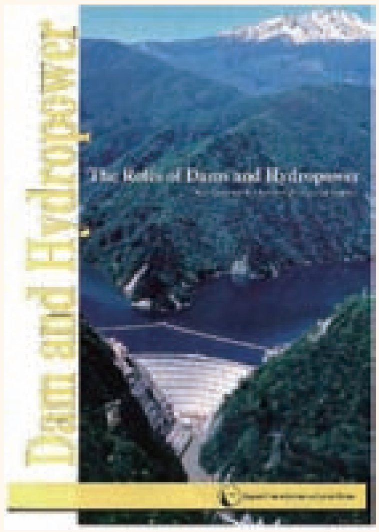
- International Sub Committee (participates in ICOLD Annual Meetings and Congresses, etc.)
- Dam Concrete Frost Damage Testing and Research Sub Committee (Long-term duration)
- Overseas Dam Project Technology Cooperation and Project Participation Study Sub Committee (Spreading Japan's Dam Technologies Overseas)
- Global Climate Change and Dams Sub Committee
- Dam Earthquake Record Database Renewal Sub Committee

2. Publication and distribution of Journals and PR magazines

JCOLD publishes its Journal, *Large Dams*, four times a year (January, April, July, October), which is distributed to members and subscribers. At ICOLD Congresses held once every three years, JCOLD publishes *Current Activities on Dams in Japan* in English, which introduces the state of dams and dam technologies in Japan, and distributes it to Congress participants (1997, 2000, 2003, 2006, and 2009).







3. Participation in annual meetings and congresses of ICOLD

ICOLD has established 21 technical committees, etc., of which Japan is an active member of 18 committees. JCOLD has established the International Sub Committee under its domestic technical committee and supports and guides its activities. At Congresses, JCOLD submits papers on many challenges (selection of important common international problems) and reports to be presented and discussed at the Congress.

Table of ICOLD Technical Committees

A. Computational Aspects of Analysis and Design of Dams
B. Seismic Aspects of Dam Design
C. Hydraulics for Dams
D. Concrete Dams
E. Embankment Dams
F. Engineering Activities with the Planning Process for Water Resources Projects
G. Environment
H. Dam Safety
I. Public Safety around Dams
J. Sedimentation of Reservoirs
K. Integrated Operation of Hydropower Stations and Reservoirs
L. Tailings Dams & Waste Lagoons*
N. Public Awareness and Education
O. World Register of Dams and Documentation
Q. Dams for Hydroelectric Energy
S. On Flood Evaluation and Dam Safety
T. Dams and Water Transfers
U. Role of Dams in the Dept. and Management of River Basins
X. Financial and Advisory*
Y. Global Climate Change and Dams, Reservoirs and the Associated Water Resources
Z. Capacity Building and Dams*

*: Committees Japan does not participate in.

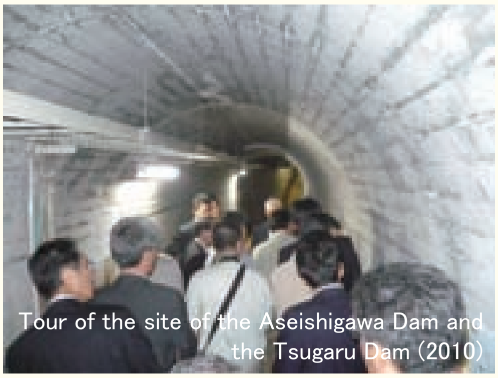
4. Dam technology lectures and discussion meetings

(Held jointly with the Japan Association of Dam & Weir Equipment Engineering)
At the meeting, the results of surveys and research by the various JCOLD technical Sub committees, papers presented to the ICOLD Congress, and results of activities by the Japan Association of Dam & Weir Equipment Engineering are reported widely to people concerned with dams. In addition, the lecturers and participants in the Technology Lecture and Discussion Meeting discuss the reports in order to improve the technologies, maintenance, and operation of dams.


Dam technology lecture and study meeting (2012)

5. Tours of dams and electric power plants

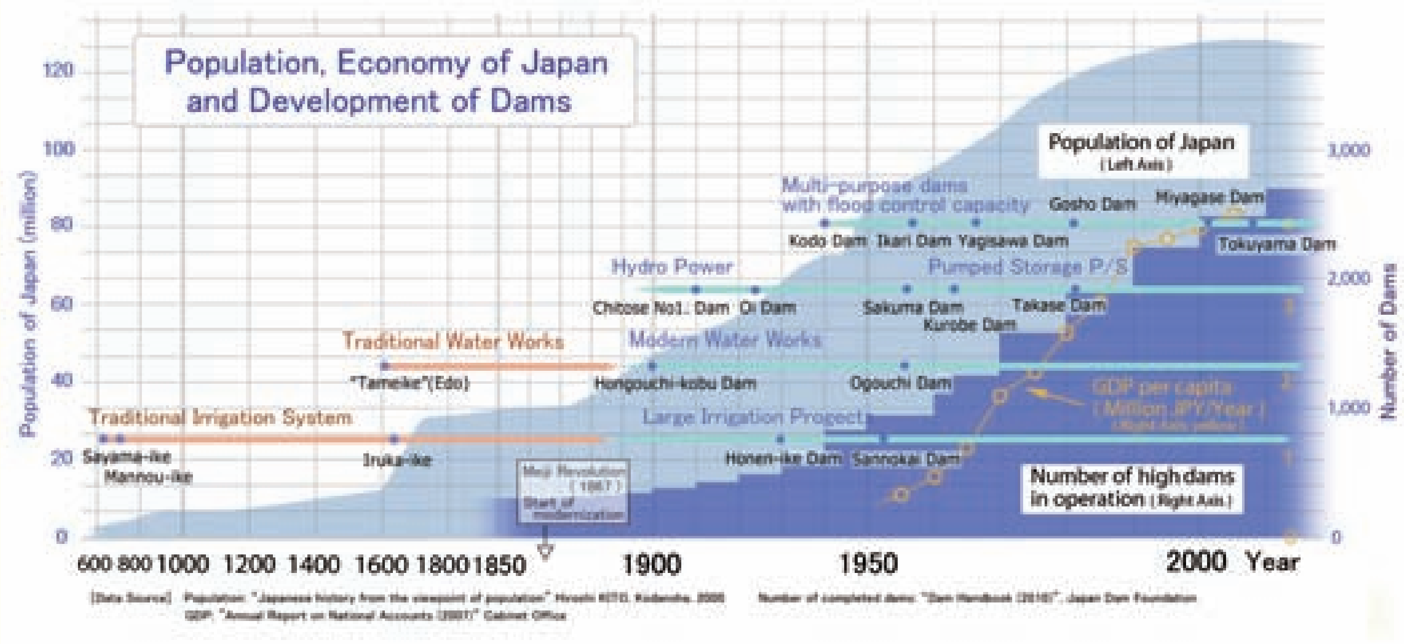
To increase mutual awareness among engineers, including JCOLD members and others concerned with dams, on improving dam and hydroelectric power plant technologies and the construction of dams, JCOLD holds tours of dams and hydroelectric power plants still under construction with the cooperation of various organizations.


Tour of the site of the Aseishigawa Dam and the Tsugaru Dam (2010)

Ⅲ. General Information about Dams in Japan

1. Changes in dam construction in Japan

In Japan, the major purpose of dams was irrigation from ancient times to the end of the feudal period in the mid nineteenth century. The Sayama-ike irrigation pond (Osaka Prefecture), which is considered to be Japan's oldest dam, was completed in 616, and is recorded in the official historic documents.
As Japan was modernized and urbanized after the Meiji Revolution (1867), Japan started to build dams with modern technology, to meet the increased demand for water and electric power. In 1891, the Hongouchi-kobu Dam (Nagasaki Prefecture) was completed as the Japan's first water supply dam. As for hydropower, the Chitose No.1 Dam (Hokkaido) was first completed in 1910. Later, multi-purpose dams with flood control capacity were constructed, with the first, the Kodo Dam (Yamaguchi Prefecture), completed in 1940.
To make more efficient use of water resources and control of flood, comprehensive projects are promoted under the concept of integrated development of river systems. Also, in recent years, redevelopment projects, such as raising the height of dams, excavating reservoirs, and upgrading discharge facilities, are being carried out more and more.



2. Major dams in Japan and around the world

There are many dams over 100 meters high in Japan, though, their reservoir capacities are smaller than those of other dams around the world, reflecting the geographical features of Japan (narrow islands and steep terrain).

Ranking of dams by height (2011 ICOLD Document)

	Japan			Worldwide			
	Dam name	Type	Height (m)	Dam name	Country	Type	Height (m)
1	Kurobe Dam	Arch	186	Rogun	Tadjikistan	Rockfill	335
2	Takase Dam	Rockfill	176	Bakhtiyari	Iran	Arch	315
3	Tokuyama Dam	Rockfill	161	Jinping	China	Arch	305
4	Naramata Dam	Rockfill	158	Nurek	Tadjikistan	Earthfill	300
5	Okutadami Dam	Gravity	157	Xiaowan	China	Arch	292
6	Sakuma Dam	Gravity	156	Grande Dixence	Switzerland	Gravity	285
7	Miyagase Dam	Gravity	156	Xiluodu	China	Arch	278
8	Nagawado Dam	Arch	155	Inguri	Georgia	Arch	272
9	Urayama Dam	Gravity	155	Manuel Moreno Torres	Mexico	Earthfill	262
10	Nukui Dam	Arch	155	Vajont	Italy	Arch	262

Ranking of dams by reservoir capacity (2011 ICOLD Document)

	Japan		Worldwide		
	Dam name	Reservoir capacity (million m^3)	Dam name	Country	Reservoir capacity (million m^3)
1	Tokuyama Dam	660	Kariba	Zimbabwe	180,600
2	Okutadami Dam	601	Bratsk	Russia	169,000
3	Tagokura Dam	494	High Aswan Dam	Egypt	162,000
4	Miboro Dam	370	Daniel Johnson	Canada	141,851
5	Ikehara Dam	338	Guri	Venezuela	135,000
6	Sakuma Dam	327	Bennett W.A.C.	Canada	74,300
7	Kuzuryu Dam	320	Krasnoyarsk	Russia	73,300
8	Sameura Dam	316	Lajeado	Brazil	64,530
9	Hitotsuse Dam	261	La Grande-2, Digues CF-01, CF-02 et Prise d'eau	Canada	62,661
10	Tamagawa Dam	254	Robert-Bourassa	Canada	61,715


Naramata Dam

3. Hydroelectric power plants in Japan (conventional hydropower and pumped storage hydropower)

The output of hydroelectric power plants in Japan accounts for about 19% of all electric power sources, and pumped storage hydroelectric power occupies top 10s of the electric power output rankings.

Electric power output ranking of hydropower plants (Document of the Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, and 2011 ICOLD Document)

	Japan (Conventional Hydropower)			Worldwide			
	Hydroelectric power plant	Electric power output (MW)	Dam name	Electric power plant	Country	Electric power output (MW)	Dam name
1	Okutadami	560	Okutadami Dam	Sanxia	China	18,200	Sanxia
2	Tagokura	395	Tagokura Dam	Xiluodu	China	12,600	Xiluodu
3	Sakuma	350	Sakuma Dam	Itaipu	Brazil	12,600	Itaipu
4	Kurobegawa-Daiyon	335	Kurobe Dam	Guri	Venezuela	10,000	Guri
5	Arimine Daiichi	265	Arimine Dam	Tucurui	Brazil	8,370	Tucurui
6	Tedorigawa Daiichi	250	Tedorigawa Dam	Sayano-Shushenskaya	Russia	6,400	Sayano-Shushenskaya
7	Miboro	215	Miboro Dam	Qilinguan	China	6,400	Qilinguan
8	Shinojiya	206	Miyanaka Dam	Krasnoyarsk	Russia	6,000	Krasnoyarsk
9	Hitotsuse	180	Hitotsuse Dam	Xiangjiaba	China	6,000	Xiangjiaba
10	Shinanogawa	177	Nishiotaki Dam	Longtan	China	5,400	Longtan

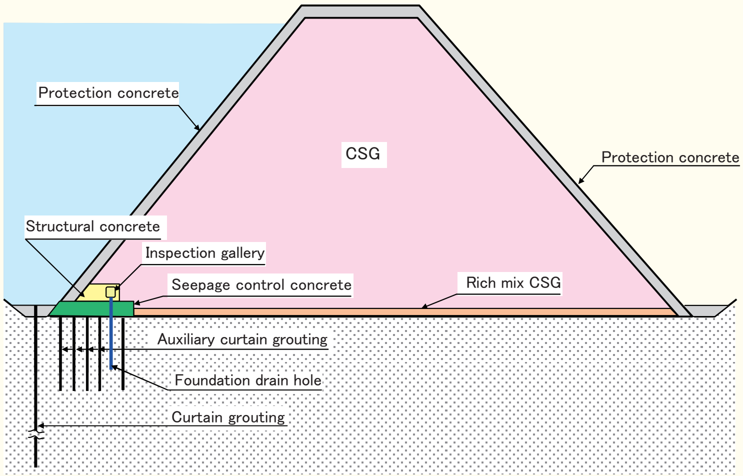
	Japan (Pumped Storage Hydropower)		
	Hydroelectric power plant	Electric power output (MW)	Dam name (upper reservoir/lower reservoir)
1	Okutataragi	1,932	Kurogawa Dam/Tataragi Dam
2	Okukiyotsu-Daini	1,600	Kassa Dam/Futai Dam
3	Okumino	1,500	Kaore Dam/Kamiosu Dam
4	Shintakasegawa	1,280	Takase Dam/Nanakura Dam
5	Okouchi	1,280	Ota Dam/Hase Dam
6	Okuyoshino	1,206	Seto Dam/Asahi Dam
7	Tamahara	1,200	Tamahara Dam/Fujiwara Dam
8	Matanogawa	1,200	Doyo Dam/Matanogawa Dam
9	Shintoyone	1,125	Shintoyone Dam/Sakuma Dam
10	Imaichi	1,050	Kuriyama Dam/Imaichi Dam


Okutadami Dam

Ⅳ. Introduction to Dam Technologies in Japan

1. Trapezoidal CSG dam

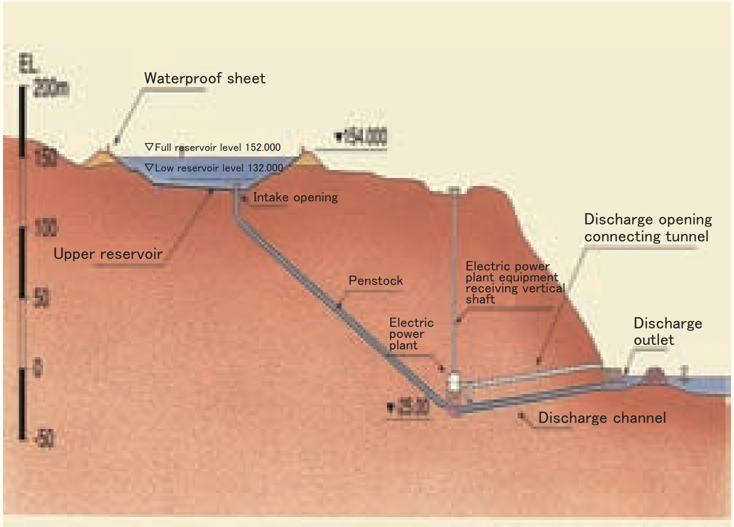
The trapezoidal CSG dam developed in Japan is a new type of dam which combines the characteristics of a trapezoidal Dam and the CSG (Cemented Sand and Gravel) construction method. It rationalizes the construction of dams in three ways: "Rationalization of materials: because the dam body materials require less strength, the required performance of the material is low and there are few restrictions on the selection of materials," "Rationalization of design: The trapezoidal shape improves seismic stability, and so the strength required of the dam body materials is lower," and "Rationalization of construction: Construction work can be executed rapidly by simplified construction facilities."



Tobetsu Dam

2. Electric power production by pumped storage of seawater

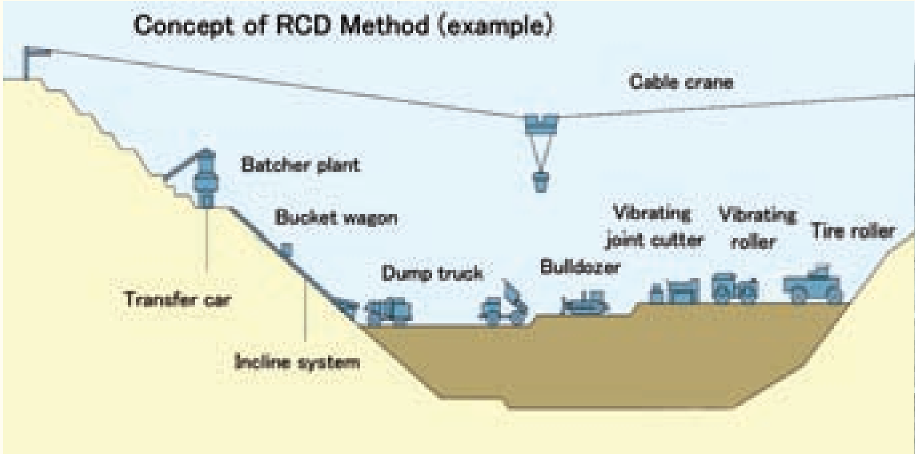
The Okinawa Yanbaru Seawater Pumped Storage Hydroelectric Power Plant in Okinawa Prefecture, which is the world's first seawater pumped storage hydroelectric power plant and where the Pacific Ocean is the lower reservoir and an artificial upper regulation pond is the upper reservoir, generates pumped storage electric power using seawater. Its penstock, pump turbine, and generator are all installed underground. Its effective drop is 136m, and its maximum flow rate is 26 m^3/s. The maximum output of the power plant is 30 MW, and when the upper reservoir is full, it can operate continuously at maximum output for six hours.



Okinawa Yanbaru Seawater Pumped Storage Power Plant

3. RCD (Roller Compacted Dam-Concrete) method

This method is executed by spreading extremely dry and lean concrete with a small cement content with a bulldozer, then compacting it with a vibrating roller. Level differences are not formed on the placed surface, so it is classified as a planar method, like the expanded layer method. Using machinery such as bulldozers and vibrating rollers permits larger volumes to be placed faster than conventional column block method, thus not only reducing the construction term and cost, but also improving work safety.

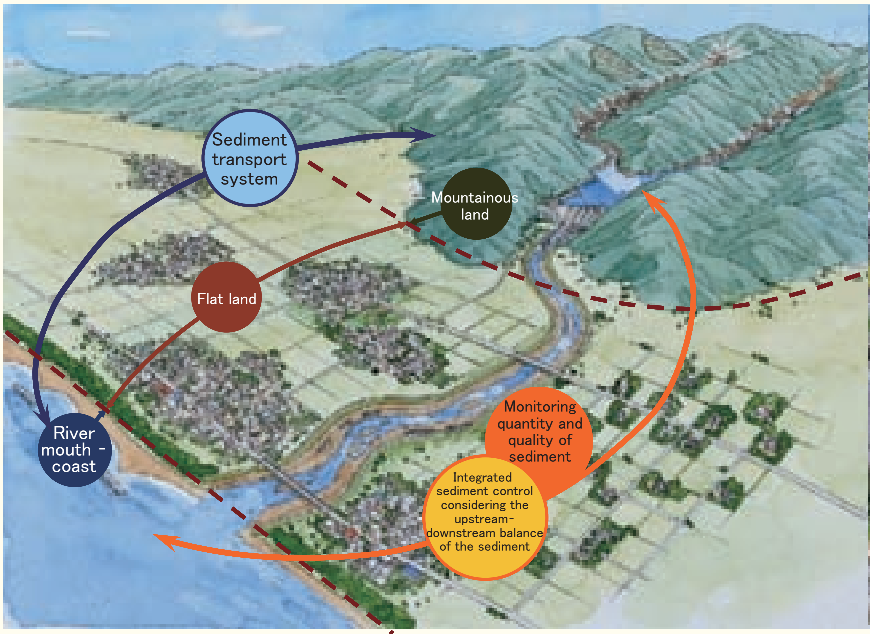


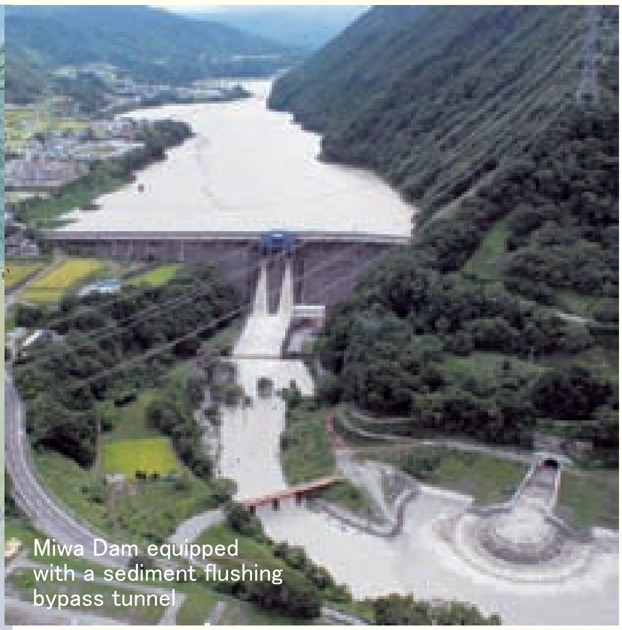

Takizawa Dam

4. Total sediment management

In Japan, sediment management based on the concept of integrating the process from the headwaters to the coast of a river basin is applied in order to stably maintain river courses, ensure the functions of dams and other structures, conserve the coast and mitigate impacts on the ecosystem.

At dams, sediment control projects and sediment check dams restrict the inflow of sediment into dam reservoirs from the river basin, and the quantity of sediment flowing into reservoirs is lowered by constructing flushing bypass tunnels, discharging sediment from reservoirs by flushing pipelines, etc.




Miwa Dam equipped with a sediment flushing bypass tunnel

V. Outline of the International Commission on Large Dams (ICOLD)

1. Outline

The International Commission on Large Dams (ICOLD) is an international dam-related survey and research body with a tradition and history dating back to its establishment in 1928. To perform its activities, it has established a number of committees to conduct surveys and research on technologies related to the design, construction, maintenance, and operation of dam related structures (including associated hydroelectric power plants).

In recent years, ICOLD has, in addition to dam technologies as described above, also been actively tackling environmental problems in response to the needs of the present age. Its achievements have been compiled as a Bulletin and released to the public.

As of April 2012, ICOLD has 95 member countries. Its headquarters has been in Paris, France since it was established, it holds an Annual Meeting every year in a city in one of its member countries, and every three years it holds a Congress following the Annual Meeting in the same city. At these Annual Meetings and Congresses, in addition to meetings of the technical committees, symposiums and workshops are held to provide opportunities to discuss various problems which the member countries face.

Member countries (95)

Albania, Algeria, America, Argentina, Armenia, Australia, Austria, Belgium, Bolivia, Bosnia-Herzegovina, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chile, China, Columbia, Congo, Costa Rica, Cote D'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominica, Egypt, Ethiopia, Finland, France, Georgia, Germany, Ghana, Greece, Guatemala, Honduras, Iceland, India, Indonesia, Iran, Iraq, Ireland, Italy, Japan, Kenya, Korea, Latvia, Lebanon, Lesotho, Libya, Luxembourg, Macedonia, Madagascar, Mali, Malaysia, Mexico, Morocco, Mozambique, Nepal, Netherlands, New Zealand, Niger, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syria, Tajikistan, Thailand, Tunisia, Turkey, Ukraine, United Kingdom, Uruguay, Uzbekistan, Venezuela, Vietnam, Zambia, Zimbabwe (Alphabetic order)

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2. Activities

(1) Technical and special committees are appointed to deal with specific subjects of member countries' concern. Each committee is expected to make research and submit reports in accordance with terms of reference.

(2) Every three years, ICOLD organizes the Congress inviting papers and presentations to discuss major and challenging themes of the times pertaining to large dams and reservoirs and associated civil engineering works.

(3) ICOLD publishes bulletins of its activity results including congress papers and minutes, technical committee reports, guidelines in dam engineering and so on.

(4) In order to promote advance in dam technology, ICOLD provides opportunities and facilitate communication to exchange and discuss updated information among experts and member countries.

Seventy-ninth Annual Meeting in Lucerne, Switzerland (2011)

Japan Commission on Large Dams

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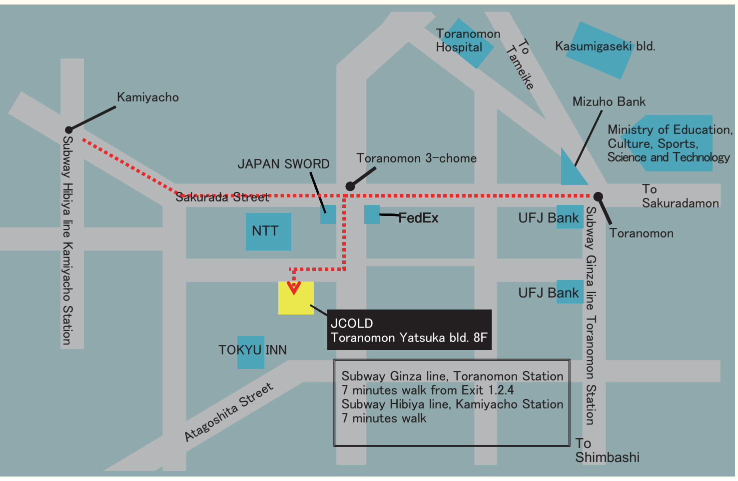

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