



# 23<sup>rd</sup> ICOLD CONGRESS



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## Brasilia : new President, new members and new tasks for ICOLD

**ICOLD held its 77<sup>th</sup> Executive Meeting and 23rd Congress in Brasilia, the capital city of Brazil. Two new member countries joined the organization and a new President was elected. Beside those developments, ICOLD members deepened their work on dams safety and sustainable development.**

In May 2009, Brasilia hosted both the ICOLD 77<sup>th</sup> Executive Meeting and the 23rd Congress. Both occasions were living demonstrations of the continuous development of the Commission and of the usefulness of its work.

For the first time in its history, ICOLD reached the 90 members mark. The Niger Committee on Dams sent a letter declaring it was "looking forward to take part in the deliberations of ICOLD" and intending, if successfully admitted, to "promptly prepare a list of the Niger dams for incorporation in the World Register."

Furthermore, the Kenya Commission of Large Dams announced that the Ministry of Water and Irrigation of its country had agreed to settle the arrears plus the membership fees for the year 2009. Those two countries were elected as ICOLD member countries by applause and thus became 89th and 90th members of ICOLD.

President Berga expressed the hope that new countries will join ICOLD in order to reach 100 member countries before 2020.

ICOLD also attained a new international dimension, with many new developments.



■■■■ In December 2008, the Commission was admitted as observer of the UN Framework Convention on Climate Change. It is therefore able to attend the sessions of the Conference of Parties. ICOLD has also signed the Global Compact of the United Nations and is playing an active role in both the UNESCO World Water Assessment Program and the World Water Council. ICOLD also was the main initiator of the "World Declaration : Dams and Hydropower for African Sustainable Development", signed by major

institutions such as the World Energy Congress, the African Union, the International Hydropower Association, the Union of Producers, Transporters and Distributors of Electric Power in Africa (UPDEA) and the International Commission on Irrigation and Drainage (ICID)

### The first Chinese President in ICOLD's history

The Brasilia Executive Meeting was attended by 63 countries. 12 more countries attended the Congress. Thus, 83% of the member countries attended the Congress. For reference, the preceding attendance was 96% in Florence (1997), 81% in Beijing (2000), 70% in Montreal (2003) (the SRAS epidemic threat lowered the attendance) and 85% in Barcelona (2006).

Dr. Jia Jinsheng, Vice President of China Water Resources and Hydro power Research (IWHR), was voted ICOLD President with 36 votes on the first ballot. He is the first Chinese President in the history of ICOLD and his tenure of office is from the Year of 2009 to 2012. Already the Secretary of CHINCOLD, the Chinese Committee on Large Dams, He formally served as ICOLD Vice-Président.

Mr. Polimon, chairman of the Spanish National Committee on Large Dams, briefly outlined Dr. Jia Jinsheng's experience and participation in ICOLD meetings and presented some of the great contributions and achievements by Dr. Jia Jinsheng in the research and construction of dams.

After the election, Mr. Jia Jinsheng improvised a speech starting with his gratitude to the committees of all countries who have supported him and expressed his honor to be voted ICOLD President.

He then emphasized that ICOLD was set up for water and the existence and development of mankind. He reiterated the most significance of water for the development of human society and environmental protection. He also expressed his hope to make ICOLD warmer, more important and more attractive through joint efforts with the officials of the commission in the three



Alessandro Palmieri, an Italian national, is the Leading Dam Specialist in the Corporate Quality Assurance and Compliance Unit at the World Bank. He regularly attends ICOLD's meetings.

## Interview Alessandro Palmieri,

**In the 90s, the World Bank was perceived as an opponent to dams. Could you explain how things changed ?**

The reasons for disengagement from the dams business in the 90s were mainly the critics from environmental non-governmental organizations and the prevailing dogma that infrastructure financing should be made by private sector. In February 2003, there was a discussion by the Board which led to the new Water Resource Strategy. It was concluded that the World Bank could not be effective by working only on the environment and reforms. We had to be engaged again in the development of infrastructures. This sent a strong signal and that received a strong support from the

Board. Now, going from intention to action is not rapid in an institution like the World Bank. There is, in some part of the management, a culture which is opposed to infrastructure investments. The above mentioned dogma is removed at the policy level, but not entirely.

**How are you going to change that ?**

We are relying on three drivers to change that situation. First, the Millenium Development Goals have been an important driver to convey the idea that infrastructures are necessary for development. Second, there is now a focus on Africa, which makes the water strategy central. And lastly, global warming has increased the concern about water storage.

More could be done : we are supporting projects but we are also assisting countries to prepare good projects and that was lacking in the last 15-20 years. Because of the dogma that private companies would do best. ●



years to come, and to make new contributions to the development and progress of society by all the efforts of senior experts and, engineers including young ones in international dam engineering.

The election of a Chinese President for ICOLD is legitimate, since China has become one of the leaders in the dams industry. While China had only around 20 large dams in 1949, it has now built half of the more than 50 000 large dams in the world. Moreover, China is not only building on its own territory, but is also exporting its engineering capacity. Chinese banks and

companies are now involved in more than 200 dams projects in 49 countries.

Then another round of elections concerned two Vice-Presidents : Giovanni Ruggeri (Italy) was elected ICOLD Vice-President for the Zone Europe and Imo Ekpo (Nigeria) was elected for the Sixth Post.

The location for the next Congress was decided and Kyoto (Japan) was chosen. The 24th ICOLD Congress will thus take place in Kyoto in June 2012. Three ballots were needed to decide which country would host the 2011 79th Annual Meeting. Eventually, the contested election was won by



Delegate from the 90 member countries are voting to elect a new ICOLD president



Switzerland and the meeting will be held in Lucerne.

ICOLD has also decided to set up two new committees : one on Capacity Building and Dams, chaired by Adama Nombre (Burkina Faso) and one on Hydraulics for Dams, chaired by B.P. Machado (Brazil).

Of course, since its creation in 1928, ICOLD has been a powerful tool for capacity building in dam engineering. The issue of capacity building as a specific activity within ICOLD started to emerge 15 years ago and has gained more significance, as the membership from less developed countries, mainly in Africa and Asia, has increased.

In 2006, ICOLD started to implement a training program for young professionals from those countries. The Ad Hoc Committee on Capacity Building and Dams will have to survey, analyze, and evaluate the role and needs of ICOLD in this area and will develop an Action Plan.

Three reports were discussed at the meeting and were adopted :

- **“Physical Properties of Hardened Conventional Concrete in Dams”**
- **“Cost savings in Dams”**
- **“Dams and Resettlement”**.



## Interview Dr Laurent Sedogo,

**Burkina Faso Minister of Agriculture,  
Water Resources and Fisheries**

Dr Laurent Sedogo, headed a 9 person-strong Burkinabe delegation. Dr Sedogo was interviewed during the Brasilia Conference by Emmanuel Grenier.

### **Why are you participating in this conference?**

We need to build dams and reservoirs, which are absolutely crucial for our agriculture. Without ICOLD, we could not have the advantage of meeting personalities who can give us support with their knowledge and experience. We are very grateful for that. The CBDB (Burkina National Committee) is a very dynamic ally of the government



Newly elected ICOLD President Jia Jinsheng addresses ICOLD Executive Meeting. He is the first Chinese president in ICOLD's history.



Inside the venue of ICOLD's 77th Executive Meeting

and we are going to help them to grow. They are very much needed to increase the technical capacities of the engineering and construction companies of the country.

**Why is it so important for agriculture?**

We can grow more than one million metric tons of potatoes and tomatoes during the dry season, and 300 000 tons of winter cereals and 100 000 tons of vegetables. Thanks to those reservoirs, the farmers can continue to work longer and produce more. They also need smaller surfaces to work on. For example, one farmer I visited recently is using a new sink combined with a small reservoir. He is now producing onions, tomatoes and potatoes on 2 hectares. Before, he was producing less on 10 hectares. Another use is cattle. Cattle farmers can increase their income thanks to the water available both for livestock and grazing.

Former ICOLD vice-President Adama Nombre (center) is listening Dr Sedogo interviewed by The Dams newsletter editor Emmanuel Grenier (right)





# 77<sup>th</sup> ANNUAL MEETING



ICOLD Board during the Executive Meeting.

They will be published as Technical Bulletins. The next ICOLD meeting will be hosted by Vietnam, one of the newest member countries. Delegates will meet in Hanoi, in May 2010.

## Four major technical questions

But ICOLD technical work did not stop at the Annual Meeting with the discussion and voting of the Reports. The 23rd Congress addressed the four major questions that were voted during the Saint Petersburg Executive Meeting :

**Question 88 on Dams and Hydropower :** the role of dams and reservoirs in the frameworks of renewable energy and sustainable development. Of course, all the technical, financial, social and environmental aspects of the planning and construction of dams for hydropower were

discussed. Special attention was given to the pumped storage schemes and to their specific dam design and requirements.

**Question 89 on the Management of siltation in existing and new reservoirs:** it is well known that the problem of siltation in reservoirs is often used by dam opponents to pretend that dams are not an effective tool for water storage. Innovative design and layout to manage siltation in reservoirs and catchment areas were presented. The different techniques experienced on existing projects (sluicing, flushing, dredging) were evaluated during the discussion, as well as the efficiency and cost of desilting procedures.

**Question 90 on the Upgrading of existing dams:** upgrading dams can be decided for improving structural and hydraulic performance or to meet new



Minister Laurent Sedogo and Secretary General Michel de Vivo proudly present the World Declaration on Dams for African Sustainable Development.



### So, water storage is changing the life of the country?

Yes, we are now a food exporting country, thanks to the irrigation program we began in 2000. Very often I receive requests from mayors or members of Parliament who want dams, because they see the benefits in the regions which were equipped. When a dam is built, people who emigrated from the villages to the cities or to foreign countries come back !

### How about energy?

We have a hydropower potential that is exploited at 20%. We want to develop further that potential but we are lacking both the technical capacity and the financing means. In the 90s, the World Bank categorically opposed those dams projects with environmental arguments. I am an environmentalist myself. I think the biggest eco-



A partial view of the delegates, alphabetically ordered.

regulatory, environmental or operational demands. The dam raising is one of the main aspects of upgrading. It is arousing both engineering and economical questions.

**And finally Question 91 on Dam safety management:** that very specific management function needs to use Risk assessment methods that take human factor into considerations. ●



## In Memoriam Dominique de Vivo

Immediately after the successful Brasilia Meeting, the ICOLD family was grief-stricken by the loss of Dominique De Vivo, the Secretary General's wife. She participated both in the Annual Meeting and the Congress. On her trip back from Brasilia, she was on board the Rio-Paris flight AF447 that disappeared over the ocean on June 1st. Dominique, mother of Alexia (23) and Carl (18), was a happy woman. She was an accomplished artist (paintings) and a wonderful mother and spouse. She is missed dearly by all those who knew her. ●

gical problem in Sahel is water stress. You cannot talk about environment without confronting that problem. Now the World Bank has changed its mind and they are discussing our irrigation program with us. But it is still very slow. We are late with our programs.

### For example?

The Samenedeni dam, whose construction begins this year. It's a 20m-high 4.4 MW dam with a 1.2 billion m<sup>3</sup> reservoir. We have been working on this project for 20 years! We needed to implement all kind of studies to convince the financing authorities. But the World Bank is helping us only on the irrigation part. We received money from seven Arab funds to be finally able to begin the project.

### What would you tell dam opponents?

Through the regime changes and the different Republics, water management and dams have always stayed at the center of the government's plans. Not because we love dams, but because they are vital for us, as I showed. ●



## ICOLD role in World Water Council

By Michel de Vivo, ICOLD Secretary General

President Jia Jinsheng and I both participated in the World Water Forum 5th General Assembly, which took place mid-October 2009 in Marseille, France. I am pleased to announce that ICOLD has been reelected to the Board of Governors of the World Water Council. There were 23 candidates and 8 elected bodies among from college n°5: "Professional organizations and academic institution". During the same meeting W.W.C., President Loïc Fauchon's mandate was renewed by the Board of Governors.


The World Water Council was established in 1996 in response to increasing concern from the global community about world water issues. Its mission is to promote awareness, build political commitment and trigger action on critical water issues at all levels, including the highest decision-making level, to facilitate the efficient management and use of water in all its dimensions and on an environmentally sustainable basis. The W.W.C. has been granted special consultative status by UNESCO and ECOSOC.

The increasingly important role played by ICOLD in this institution is recognized by its reelection. In Istanbul, during the 5th World Water Forum organized in March 2009 by the W.W.C., ICOLD

forcefully intervened during the whole forum, but especially on the 3rd theme: "Ensuring Adequate Water Resources and Storage Infrastructure to Meet Agricultural, Energy and Urban Needs". ICOLD was in charge of the wrap-up and the synthesis of that theme.

Professor Luis Berga, at that time ICOLD President, co-chaired that wrap-up but also intervened during the Chinese government session on "Risk Management of Water Infrastructure Projects Related to Mega Natural Disasters". Public awareness and education committee chairman Peter Mulvihill co-chaired another session devoted to "Stakeholder Participation for Sustainable Water Resources Management". President Jia Jinsheng co-chaired a session titled "Behind a Wall or Beneath the Soil: How to Meet Our Storage Needs?", convened by ICOLD and by the Chinese Institute of Water Resources and Hydro-power Research. Many other ICOLD members addressed the forum and that very active role enabled ICOLD to deliver its message to the 30 000 participants from 182 countries, including 90 ministers and 250 parliamentarians. The next World Water Forum will take place in Marseille, France in 2012 and ICOLD intends to replicate the Istanbul success. ●





# Lessons learnt from observed **damage of dams** and power plants caused by the May 12, 2008 **Wenchuan earthquake**

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## Wenchuan earthquake

In the afternoon of May 12, 2008 a strong earthquake occurred in China's Sichuan province with its epicentre at a distance of 17 km from the 156m-high Zipingpu concrete face rockfill dam (CFRD), which was completed in 2006. The earthquake ruptured a 240km-long segment of the Longmenshan fault system separating the Tibetan Plateau from the Chengdu Basin. About 87 000 people were killed or are still missing. Many buildings and infrastructure projects were





the joint CHINCOLD/ICOLD mission on the Wenchuan earthquake

damaged including 1803 dams and reservoirs and 470 hydropower plants with an installed capacity of 3.3 GW. The main engineering features of the earthquake are as follows:

- **Local magnitude: 8.0**
- **Maximum recorded peak ground acceleration on ground surface: 958 cm/s<sup>2</sup> (horizontal component) and 948 cm/s<sup>2</sup> (vertical component);**
- **Duration of strong ground shaking: 90 s to 120 s; and**
- **Maximum fault movement at ground surface:**  
**4.7 m (horizontal) and 4.8 m (vertical).**

Sichuan is the province with the largest hydropower potential in China and has about 6678 dams and reservoirs. Some of the extraordinary projects completed recently are the 240 m high Ertan arch dam, the 156m-high Zipingpu CFRD, and the 132m-high Shapai arch dam, the world's highest RCC arch dam. Several very large

projects are either under construction or under design such as the 278m-high Xiluodu arch dam (12.6 GW), the 186m-high Pubugou earth core rockfill dam (3.6 GW), the 305m-high Jinping 1 arch dam (3.6 GW), etc. However, only the Zipingpu and the Shapai dams were located relatively close to the ruptured fault segments and experienced strong ground-shaking. The other dams and also the Three Gorges Project are several hundred kilometers away from the epicentre and no damage was reported from these dams.

The Wenchuan earthquake is the earthquake, which has affected more dams than any other previous earthquake. It is also the most important seismic event that has occurred since the creation of ICOLD's earthquake committee some 40 years ago. Therefore, plans for a mission were discussed with Chinese colleagues immediately after the earthquake. However, due to the severe rockfall hazard and the interruption of roads in the epicentral region, a visit to major dams was not possible at that time. Finally a joint ICOLD-CHINCOLD was arranged for March and April 2009, i.e. 11 months after the earthquake. Thirteen foreign dam and earthquake experts from Austria, Canada, Japan, Switzerland, the U.K. and the USA participated in this mission. The local arrangements were made by Jia Jinsheng (ICOLD President and Secretary General of CHINCOLD), and Chen Houqun (Vice-



chairman of the ICOLD Committee on Seismic Aspects of Dam Design. The program consisted of a one day seminar in Beijing where the participants were briefed on the Wenchuan earthquake followed by a three-day visit of dam and run-of-river power plants in Sichuan and a final one-day seminar in Chengdu where dam owners and designers presented specific dam projects affected by the earthquake. To conclude, various topics were discussed, i.e. (i) the personal experience gained from the mission, (ii) the lessons learnt, (iii) the topics for possible cooperation of ICOLD with CHINCOLD, and (iv) a paper on reservoirs and the Wenchuan earthquake

This joint mission was a great success although only a fraction of dams damaged by the earthquake could be visited or discussed during the two seminars. This visit was really a unique opportunity for all participants interested in dams and earthquake safety.

### Special features of earthquake hazard in the case of storage dams

The earthquake hazard is a multiple hazard, which may have the following features in the case of storage dams:

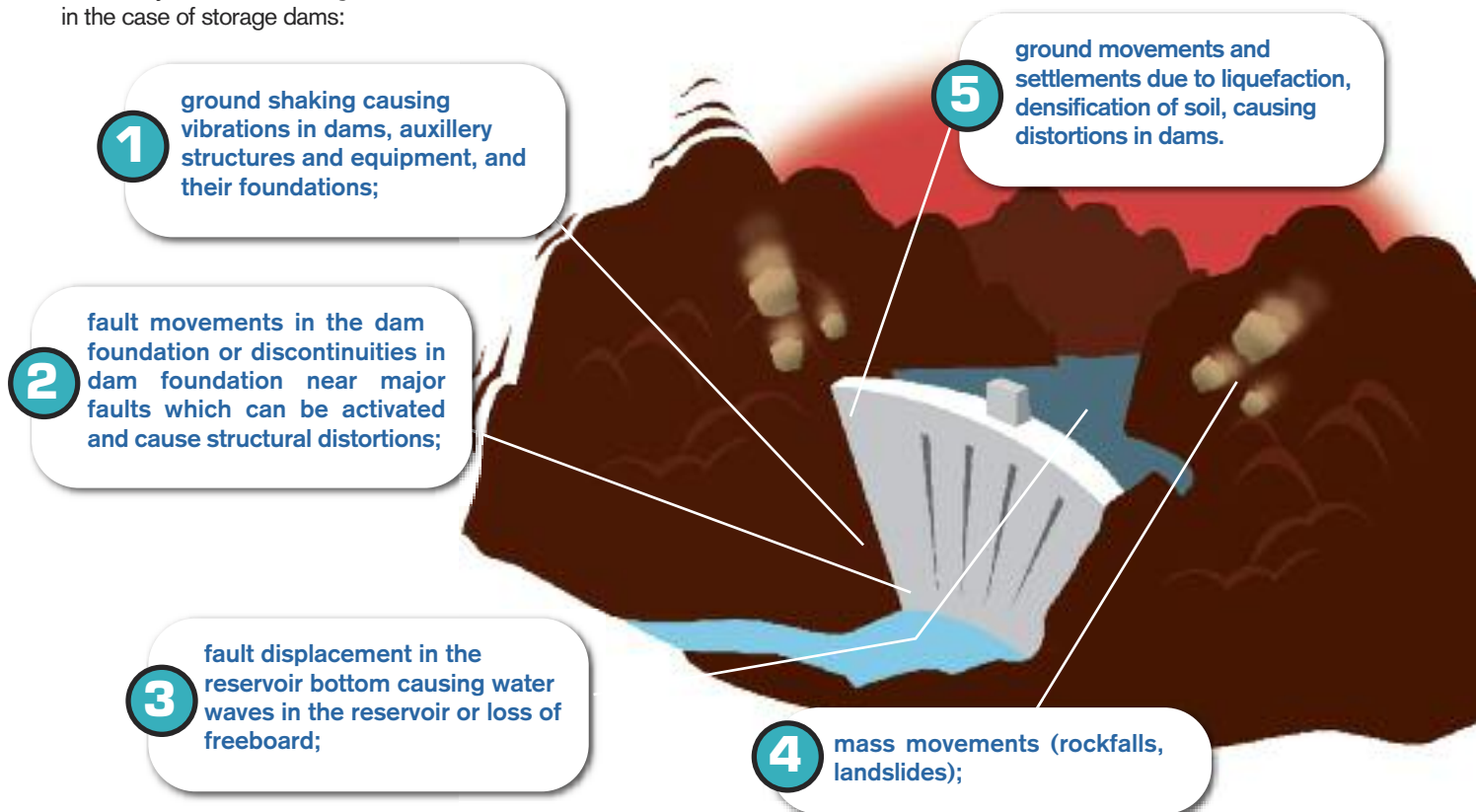
Usually earthquake regulations focus on ground shaking but in the epicentral region of the Wenchuan earthquake substantial damage has been caused by mass movements, i.e. :

- Large number of rockfalls blocking access roads to dams, causing damage at dam sites and locations of appurtenant structures, destroying powerhouses and masts of transmission lines, aqueducts, etc.
- Landslide dams blocking rivers at several locations;
- Overtopping of run-of-river power plants; and
- Failure or damage of hydromechanical equipment (gates, penstocks), etc.

### Shapai RCC arch dam

During the May 12, 2008 Wenchuan earthquake the 132m-high Shapai dam, the world's highest RCC arch dam, was subjected to strong ground shaking.

The dam is a three-centered arch structure with vertical upstream face. The crest length and thickness are 250.25 m



and 9.5 m respectively. The maximum thickness at the base is 28 m. The dam is located 30 km away from the epicenter and, during the earthquake, the reservoir was at normal water level of 1866.0 m. There are two vertical contraction joints and two induced joints with a spacing of about 50 m. The dam is founded on granite and granodiorite and was completed in 2003. The seismic design of the dam was based on a horizontal peak ground acceleration of 0.138 g.

### Zipingpu concrete face rockfill dam

The 156m-high Zipingpu CFRD is one of the largest CFRDs in China and one of the key projects for water supply and irrigation for the Chengdu basin. The dam was completed in 2006 and represented the latest CFRD technology in China. The dam was designed for an intensity of VIII (Chinese scale), with a design peak ground acceleration of 0.26 g. The epicentral distance of the



**Fig. 1:** Upstream face of Shapai RCC arch dam



**Fig. 2:** Downstream face of Shapai RCC arch dam

During the author's visit in early April 2009 no signs of damage could be observed; however, the reinforced concrete elevator building on the crest and the superstructures of the intake towers suffered some repairable inelastic deformations. The powerhouse located several kilometers downstream was severely damaged by high velocity rockfalls and the movement joint of the penstock failed, causing flooding of the powerhouse.

dam was 17 km. During the earthquake the reservoir level was low and its volume was 300 Mm<sup>3</sup>. Under normal operation conditions the reservoir volume is 1100 Mm<sup>3</sup>. The crest of the dam and the concrete face were damaged. Of greatest interest was the damage to the concrete face and water-proofing system which consisted of damage of the vertical joints and the offset of the horizontal joint between the second and third stage slab construction.



After the earthquake the maximum settlement at the dam crest was 735 mm and the horizontal deflection in downstream direction was 180 mm. The cross-canyon deformation of both abutments was 102 mm.

When the earthquake occurred, the water level in the reservoir was low. If the reservoir had been full, it is difficult to estimate the possible impact on the dam, the concrete face, and the waterproofing system.

documented case of RTS occurred at Lake Mead, the reservoir at the 220 m high Hoover arch dam in the US. Since then there have been several strong earthquakes in India, China, Greece and Zambia which are suspected of being reservoir triggered. The maximum magnitude of an RTS event that has been identified to date is 6.3. ICOLD recommends that RTS needs to be considered for large dams over 100 m in height. ICOLD has also published a bulletin which presents



**Fig. 3:** Damage at crest of Zipingpu CFRD (downstream face)



**Fig. 4:** Damage at crest of Zipingpu CFRD (downstream face)

### Zipingpu reservoir and the Wenchuan earthquake

Shortly after the May 12, 2008 Wenchuan earthquake reports appeared which suggested that this devastating earthquake may have been triggered by the impounding and operation of the Zipingpu reservoir, an effect known as reservoir-triggered seismicity (RTS). RTS has been considered in the dam engineering community since 1935, when the first

the state of knowledge on reservoirs and seismicity (ICOLD 2009).

According to ICOLD recommendations, high-hazard dams are designed to safely withstand ground motions caused by the maximum credible earthquake (MCE). Therefore RTS seismicity is not a direct safety problem for a well-designed dam as the maximum reservoir-triggered earthquake cannot be stronger than the MCE. However, RTS may still be a problem for



other structures, buildings and appurtenant works because they may have a much lower earthquake resistance than the dam.

Adequate monitoring of RTS prior, during and after impoundment of a reservoir provides the most conclusive evidence as to whether or not water impoundment causes triggered earthquakes. To help distinguish between background seismicity and RTS, monitoring should start well in advance of the impounding of the a reservoir.

During the one-day seminar in Chengdu on April 3, 2009 the question of triggering the Wenchuan earthquake by the Zipingpu reservoir was also discussed. The main conclusions of this discussion are as follows:

**1** The maximum water level of the Zipingpu reservoir (elevation 875.4 m) has not exceeded the natural water level (elevation 877 m) where the Min River crosses the Beichuan-Yinxu fault. Therefore, the original hydrogeological conditions of the Beichuan-Yinxu fault have not been affected by the impounding of the Zipingpu reservoir.

**2** In August 2004, 13 months before reservoir impounding, an earthquake monitoring network with seven fixed stations was set up in the reservoir region. In October 2006, the reservoir water level reached elevation 875.4 m, 1.6 m below normal storage level. The corresponding reservoir volume was 900 Mm<sup>3</sup>. In July 2006 and May 2007, the water level was lowered to elevation 820 m. Before the Wenchuan earthquake (April 30, 2008), the reservoir water level was at elevation 828.95 m, the corresponding reservoir volume was 300 Mm<sup>3</sup>. On the basis of statistics on the annual seismic activity of the reservoir (obtained from the Department of Reservoir Earthquake Research of the Sichuan Seismological Bureau), the frequency and intensity of seismic activity after impounding of the Zipingpu reservoir

were almost the same as statistics recorded before impounding? The recorded seismicity has also no relation to the reservoir water-level variation.

**3** The additional stresses and changes in strength properties caused to a 15km-deep fault by the additional weight of water in the reservoir and the possible build up of pore pressures are very minor compared to the pre-existing stresses and strength properties.

**4** The Wenchuan earthquake does not have any of the typical characteristics of RTS given below:

- The seismic events monitored during and after impounding are definitely more frequent than the background seismicity before impounding.
- With the increase of storage level and with larger oscillations of storage levels, the frequency and magnitude of RTS phenomena increase.
- In most cases, the triggered events tend to be scaled down, after peaking, towards ambient background activity.
- In a number of triggered cases, the observed intensity of shaking sharply decreased with distance from the epicenters, which usually cluster around the reservoir. In most cases, the activity starts soon after the beginning of impounding and grows with reservoir levels, restarting as a rule after quick changes in reservoir levels.
- It has been proposed to use as a diagnostic tool the relationship between frequency and magnitude of seismic events, with smaller events indicating triggered seismicity although this indicator is considered controversial.
- It is considered that more triggered events are linked to normal and strike slip faulting than to thrust faulting.



**Fig. 5:** Damage in wall of powerhouse of Shapai dam project caused by rockfall

Due to these considerations, the possibility of the Wenchuan earthquake being RTS is very unlikely. Other reservoirs in the epicentral region such as the reservoir of the 132m-high Shapai roller compacted concrete arch dam completed in 2003 are much smaller than that of the Zipingpu dam and do not intersect with the Longmenshan fault.

### Conclusions

Based on the discussion of the different factors contributing to reservoir-triggered seismicity and based on the state-of-knowledge on RTS phenomena it is concluded that there is no evidence that the Wenchuan earthquake was triggered by the Zipingpu reservoir.

The Wenchuan earthquake has shown that in steep valleys rockfalls and mass

movements can be more hazardous than ground shaking (Fig. 5).

The damage of the concrete face of the Zipingpu CFRD has been repaired and the reservoir is under normal operation. Other damage at the dam crest and on the structures on top of the intake towers still have to be repaired.

Studies on the seismic safety of dams affected by the earthquake are under way and the main conclusions and lessons learnt by dam engineers will be published in the near future. ●

### References

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# 78<sup>th</sup> ICOLD Annual Meeting Hanoi 23-26 May 2010

The Vietnam National Committee on Large Dams (VNCOLD) was founded in 2004 and has been a member of ICOLD since 2005. A fairly young member of ICOLD, VNCOLD has already International Symposium on Water Resources and Renewable Energy Development”.

As usual, the ICOLD Technical Committees will meet during the Annual Meeting, which will take place in the historic City of Hanoi, the Capital of Vietnam. The Vietnamese organizing committee has also prepared a special one day symposium on “Dams and Sustainable Water Resources Development”.

**Come to Hanoi ! Visit the site : [www.vncold.vn/ICOLD2010/](http://www.vncold.vn/ICOLD2010/)**



**Welcome to  
the 78<sup>th</sup> ICOLD Annual Meeting in Hanoi !  
23 – 26 May 2010**

**Bienvenue à  
la 78<sup>ème</sup> Réunion annuelle de la CIGB à Hanoi !  
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