The Iranian national committee was the only committee to put forward a proposal to hold the 2022 90th Annual Meeting. The proposal was accepted and the meeting will be held in Shiraz.

ICOLD has entered into an agreement with an international publishing house Balkema for publishing its work. ANCOLD will be investigating this arrangement to see whether there it may be worthwhile for ANCOLD to leverage off this agreement or establish its own similar arrangements.

The number of ICOLD technical committees on which ANCOLD representatives have played a role are as below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Technical Committee Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 2013</td>
<td>Seattle, USA</td>
<td>16</td>
</tr>
<tr>
<td>June 2014</td>
<td>Bali, Indonesia</td>
<td>16</td>
</tr>
<tr>
<td>June 2015</td>
<td>Stavanger, Norway</td>
<td>14</td>
</tr>
<tr>
<td>May 2016</td>
<td>Johannesburg, South Africa</td>
<td>13</td>
</tr>
<tr>
<td>July 2017</td>
<td>Prague, Czech Republic</td>
<td>13</td>
</tr>
<tr>
<td>July 2018</td>
<td>Vienna, Austria</td>
<td>15</td>
</tr>
</tbody>
</table>

**ICOLD Asia Pacific Region Meeting**

Shane McGrath represented ANCOLD at the ICOLD Asia-Pacific Regional Group (APG) meeting.

The activities within each member country were presented. The information highlighted the differences in institutional arrangements between the member countries. The voluntary and self-funded approach taken by Australia and New Zealand is quite different to that in several Asian countries where government and direct company support appears to be more commonplace. This results in a significant difference in the scope of activities that ANCOLD can contribute to in this forum in comparison with some others.

The Asia Pacific Group continues to gain traction amongst its members and reaching out beyond the core membership of Japan, Korea and China. The next APG in-country meeting will be held in Iran in November 2019. APG member countries are also invited to attend the 10th East Asia Dams Conference to be held in Hangzhou during October 2018.

The Executive continues to search for meaningful ways in which ANCOLD can engage in this forum for the benefit of its members.

**ICOLD Technical Committee Reports**

Note: Where “presentations” are mentioned in these reports, if the presentation is stated as “available” it will be posted in the members section of the ANCOLD website under “ICOLD Information”.

**COMMITTEE A  
COMPUTATIONAL ASPECTS OF ANALYSIS AND DESIGN OF DAMS (2014-17)**

The annual meeting of Committee A took place on 1st July 2018, with Guido Mazza (Italy) as Chairman and Gerald Zenz (Austria) as Vice-Chairman, representatives from 14 countries and nine external observers.

The main outcomes of the annual meeting are summarised below:

- Organisers of the “14th Benchmark Workshop on Numerical Analysis of Dams” held in Stockholm, Sweden, on September 2017, summarised the main outcomes of the event. The themes covered in the Workshop were:
  - Theme A: “Cracking of a Concrete Arch Dam due to Seasonal Temperature Variations”.
  - Theme B: “Static and Seismic Analysis of an Arch-Gravity Dam”.
  - Theme C: “Embankment Dam Behaviour – Prediction of Arching and Cracking Potential”.
  - Theme D: “Risk Analysis – Assessment of Reliability for Concrete Dams”.

Presentations with the description of each theme will be available
• Task Force 1 of Committee A is currently preparing the ICOLD Bulletin “Non-Linear Modelling of Concrete Dams (NLMCD)”. In synthesis, the bulletin will cover the following aspects:
  - Why and when a NLMCD is needed.
  - Solution methods, description, features and convergence criteria of different methods.
  - Available Finite Element Modelling codes for NLMCD.
  - Recommended parameters values for NLMCD.
  - NLMCD examples and case histories.
  - The draft version of the NLMCD Bulletin is planned to be ready for submission to Committee A by the next ICOLD Annual meeting.

• Task Force 2 of Committee A is dedicated to risk analysis of dams. The task force reported on the activities carried out in this disciple, which included the identification of risk assessment themes covered during the last four Benchmark Workshops (Valencia, Graz, Lausanne and Stockholm).

• Task Force 3 of Committee A is currently organising the preparation of the ICOLD Bulletin “Capitalization of the Benchmark Workshops Results since 1991”. The committee chairman made a presentation with the main topics that will be covered by the bulletin (presentation available).

• Organisation of the “15th Benchmark Workshop”. It will take place in Milan, Italy, 2019 on 10th to 12th September 2019. The themes approved for the Workshop are:
  - Theme A: “Evaluation of Numerical Models in the Analysis of Pine Flat Dam”.
  - Theme B: “The Effect of Time-dependant Operational Loads on the Structural Integrity of Concrete Dams”.
  - Theme C: “Seismic Performance of the Bituminous-Faced Rockfill Menta Dam - Prediction of Stress-Strain Behaviour and Potential Damages”.

  Presentations with the description of each theme are available. Specific theme information will be available for the participants in January 2019. Presentations with the proposed solution by participants to be submitted by June 2019.

• Slovenia presented a proposal to host the “16th Benchmark Workshop” in this country. Confirmation of the location and dates will be discussed during the next Committee A meeting in 2019.

• The ICOLD “Committee on Concrete Dams” will commence the preparation of the ICOLD Bulletin “Arch Dams”. Committee A will collaborate in the bulletin by providing the extensive experience in numerical analysis of arch dams accumulated during previous Benchmark Workshops.

• SWISSDAMS presented two national bulletins prepared in 2017 by the Swiss Committee on Dams (both in English version):
  - “Concrete Swelling of Dams in Switzerland”.
  - “Floating Debris at Reservoir Dam Spillways”.

  Both bulletins are attached to this report.

• A joint workshop with “Committee B on Seismic Aspects of Dam Design” was held on Monday, July 2nd. The workshop comprised a total of ten individual presentations from members of both committees.

Francisco Lopez
ANCOLD Representative
COMMITTEE B
SEISMIC ASPECTS OF DAM DESIGN (2013-17)

The committee being created in 1968 celebrated its 50th anniversary this year at the Annual Meeting in Vienna.

K. Addo has replaced Steve Rigbey as the member for Canada.

1. Reports presented from Committee Members

Reports were presented from USA, Canada, Japan, Italy, France, Korea and China. Some key points from these presentations were:

China – A report on large-scale (45cm diameter) mass concrete static and dynamic tensile and compressive strength testing was presented. For a compressive strength of 60 MPa the average dynamic tensile strength of several samples was less than 3 MPa. This is considerably smaller than the value of 10% of the static compressive strength often used for the static tensile strength in seismic safety assessment of concrete dams. A value 50% higher is often used for the dynamic tensile strength under seismic action. Similar tests are currently being undertaken for RCC dams. The presentation containing more details is available.

The damping ratio and the dynamic tensile strength of mass concrete are the main dam-related parameters used in the seismic safety assessment of concrete dams. In general, too optimistic values may be being used.

(i) USA – Current initiatives involve preparation of the following publications:

   a. Guidelines for seismic deformation analysis of embankment dams
   b. Update of guidelines for selection of ground motion parameters for dams
   c. Update of guidelines for seismic design and evaluation of appurtenant structures, and

   Upcoming workshops on:
   a. Evaluation of Numerical Models and input parameters in the analysis of concrete dams, 2018 USSD meeting

   The presentation containing more details is available.

(ii) Korea – A presentation was made on centrifuge modelling to assess the seismic behaviour of dams. Applications of such modelling include amplification characteristics of ground acceleration, settlement and horizontal deformations and induced stresses on CFRD facing. Copy of presentation is available on the ANCOLD website.

(iii) Italy – A presentation was given on the observed behaviour of Italian dams under historical earthquakes. The conclusions from the 100 examined cases were:

   a. In most cases, dams and power plants were not influenced by seismic events;
   b. Two earth dams showed damages resulting in needed repair work, namely Ogliastro and Acciano
      • Ogliastro basin: Bituminous facing cracking with consequent leakage of water through the dam body;
      • Acciano dam: Longitudinal cracks parallel to the top of the dam together with transverse cracks;
   c. The Piana degli Albanesi masonry gravity dam suffered a release of water through the structure without compromising the dam stability;
   d. In general for power plants, some damages occurred but they often didn’t prevent normal functioning.

   The procedure for activation of post-earthquake inspections was also presented. The presentation is available.
2. Status on Terms of Reference

2.1. Position Paper on dam safety and earthquakes
This position paper, approved in 2010, will be finally published in 2018.

2.2. Seismic design aspects of CFRDs, dams with asphalt core, and dams with other types of liners and internal membranes
A draft report on Embankment Dams with asphalt core or facing was presented and discussed. The bulletin chapters on CFRDs and geomembranes are in progress.

2.3. Review of nonlinear seismic analysis procedures for concrete and embankment dams
This work is being undertaken in conjunction with the ICOLD computational committee. A joint workshop was held in Vienna on this topic.

USSD is working on a document on the non-linear dynamic analysis of embankment dams and will be used as an input to an ICOLD bulletin.

2.4. Interpretation of seismic data obtained from dams
Progress continues on the draft bulletin. The bulletin will include:

- Comparison of PGA attenuation
- Amplification ratio of peak acceleration of gravity, arch, rockfill and earthfill dams
- Natural period of such dams
- Damping characteristics of dams
- Behavior changes of dams during earthquakes.

Results were presented on the time-dependent strength degradation of a rockfill dam in Japan based on an analysis of recorded strong motion data.

A presentation was made on a soon to be published report based on a joint French-Japanese co-operation program on the seismic analysis of dams, in which data from the Japanese strong motion database were used. The presentation is available. It will be a comprehensive report covering different types of dams and safety related hydro-mechanical equipment.

2.5. Points of interest

A magnitude 7.3 earthquake occurred on the border of Iran and Iraq on 2 November 2017 causing damage to the Iraqi 128m high Darbandikhan rockfill dam that was completed in 1961. The seismic safety of the dam is of concern to the dam owner. Most of the damage occurred in Iran with 630 people killed but no dams in Iran were damaged.

The 10th commemoration of the Wenchuan Earthquake in China of 12 May 2008 was held at an international symposium on Seismic Safety of Large Dams in Chengdu. During the Wenchuan earthquake about 2000 dams and reservoirs were damaged.

Ian Landon-Jones
ANCOLD Representative
COMMITTEE C
HYDRAULICS FOR DAMS (2013-16)

General
The Committee on Hydraulics for Dams met in Vienna, Austria, on the 1st July 2018.

This was the tenth and last meeting of the Committee on Hydraulics for Dams in the programme to carry out the tasks related to the preparation of complementary issues of Bulletin 58 -1987, and was chaired by Brasil Mercado of Brazil.

In 2019 a new phase will start defined by new Terms of Reference (TOR) and led by the new Committee Chairman, Dr. Anton Schleiss from Switzerland. The main objective of the meeting was to review the proposed TOR for the new phase of work of the Committee.

Discussions on the proposed Terms of Reference for the new phase of the Committee work

The proposed TOR which will be submitted to the General Assembly of ICOLD, will be structured as follows:

Title of the bulletin to be prepared: Recent and future challenges for spillways of dams

Contents criterion:
Concentrate on current and future issues which influence design and operation of spillways.

After discussion and screening of the topics, it was decided to concentrate on the following items given by the following preliminary list of the bulletin chapters:

1. High velocity flow on chutes and corresponding outlet structures (cavitation, air entrainment, waves, flow bulking, splashing, etc.)
2. Smooth – stepped chutes
3. Structural design including joints, sealing, drainage systems of chute linings interacting with fluid considering dynamic loadings and vibrations
4. Need of surveillance and monitoring of spillways
5. Uprating of existing spillways for increased design discharge; remedial works
6. Supersaturation of flow downstream of spillways

There was a general agreement to the proposed subjects and to the structure of the final TOR.

Programme for the preparation of the Workshop to be held next year in Ottawa

Following the rules of ICOLD, a workshop on the proposed contents of the new bulletin has to be presented by the Committee during the next Annual Meeting, in Ottawa, in 2019. For the preparation and presentation of the Workshop on the 10th of June, 2019, the new Chairman established the responsibilities of members and allowable time for presentation.

Pending work for the publication of Committee bulletins

The bulletin on Spillway Innovations is being translated into French and will be put in the format required for publication by the CRC Publisher.

The bulletin on Blocked Spillway Passages was distributed to National Committees of ICOLD and received various comments, some noting the lack of an introduction, the nomination of Committee members and some observing the extent of subjects treated could have been expanded. Robert Wark, who is the co-ordinator of the preparation of the bulletin, made a presentation of the issues and explained that the extension of the subjects treated was approved by both Technical Committees involved in its preparation, and that the remaining questions observed by commentators will be taken into consideration in the revision which will be done after considerations by the General Assembly of ICOLD. The General Assembly accepted the bulletin assuming that all comments and suggested modifications will be taken into account in the final revised version.

Bob Wark
ANCOLD Representative
COMMITTEE D
CONCRETE DAMS (2012-18)

The meeting of the Technical Committee on Concrete Dams, chaired by Mike Rogers, was attended by 20 members and 2 substitutes, as well as 11 observers. This was the last meeting chaired by Mike Rogers, who was elected as President of ICOLD. The new chairman is Marco Conrad (Switzerland), with Quentin Shaw (South Africa) nominated as vice chair.

Bulletin on Expanding Concrete in Dams
Dr Robin Charlwood provided an update on the bulletin. Originally intended to be a single bulletin, “The Bulletin on Expanding Concrete – Diagnosis, Rehabilitation and Prevention” will consider all potential forms of expansion due to chemical and physical processes, including AAR, it is now proposed that it be split into three bulletins:-

1. Managing Expanding Concrete Bulletin
2. Prevention of Expanding Concrete Bulletin
3. Case Histories of Expanding Concrete Bulletin

This was accepted by the committee without objection.

Bulletin on RCC Design
An update was provided by Dr Quentin Shaw (South Africa). The Bulletin is now complete pending approval at ICOLD General Assembly and French translation. NEW Bulletin on Modern Methods and Criteria for Arch Dam Design and Analysis

A discussion of the bulletin was led by Dr Quentin Shaw. It has been identified that a guidance document is required, proposing methodologies and design criteria.

The primary objectives of the proposed new ICOLD Bulletin on Arch Dam Design Methodologies and Criteria can be defined as follows:

1. To establish the spectrum of analyses required for each stage of the arch dam design development process (addressing structural, geotechnical, thermal, thermo-mechanical & construction analyses);
2. To establish appropriate analysis methodologies for each stage of arch dam design and each load type;
3. To establish typical criteria for design under each analysis methodology.

NEW Bulletin on Considerations for Aging Concrete Dams
Discussion around the contents of this bulletin identified that it could include the following topics:

1. Physical Properties of Ageing Concrete
2. Guidelines for Inspection of Aging Concrete Dams
3. Expectations for Aging of Concrete Dams
4. A Framework for Estimating Remaining Life of Aging Concrete Dams

Technical Paper on Sustainable Concrete Dam Construction
Dr Marco Conrad (Switzerland) provided an update. There has been no progress on this technical paper. It was agreed to get some interest in this topic over the next 12 months otherwise it may be dropped from the Terms of Reference.

Proposed new Bulletin on Raising of Concrete Dams
It was agreed to postpone discussion of this bulletin until ICOLD 2019

Discussion of Possible databases
The need for and the content of possible databases was discussed, with the ongoing and long-term objective of assembling and building a database on concrete dams, capturing information for existing and new concrete dams and to keep building on this. As an initial step it was proposed identifying concrete dams related databases already existing in the public or engineering domain. The discussion included aspects of the discussion on long-term hosting and maintaining databases.
Specific databases discussed included

- Proposed Database on Expanding Concrete Dams – first proposed in 2009, this has not been progressed in recent years;

Proposed Database on Physical Properties of Concrete Dams - first proposed in 2009, this has not been progressed.

Peter Buchanan
ANCOLD Representative at the committee meeting

COMMITTEE E
EMBANKMENT DAMS (2014-17)

ICOLD Committee on Embankment Dams

The following presents a summary of the Embankment Dams Committee meetings held during the 2018 ICOLD Congress in Vienna.

1. **Bulletin on Geotextiles in Dams (presented by Danie Badenhorst):**

   This bulletin is in preparation and covers non-critical filters and “adjunct” filters; designed to allow the reduction in filter width or used in combination with lesser quality filters.

   A draft update of the bulletin was submitted to selected people from the committee for review and comment prior to the meeting. There was discussion at the meeting on:
   
   - Applicability of geotextiles in dams for filters: it was emphasised that the new Bulletin approved use of geo-filters as adjunct (in addition) to sand filters in critical situations (and were not of themselves appropriate as a critical filter).
   - Requirement for inclusion of more case histories where geo-filters were used.

   The next stage was for the Bulletin to be prepared in ICOLD format and submitted to the committee for review and comment.

2. **Bulletin on Deformation and Cracking in Embankment Dams (presented by Gavan Hunter):**

   A framework for a bulletin on deformation and cracking in embankment dams was presented at the meeting.

   The objective is to provide more specific data on crack locations, widths and depths for examining whether concentrated leak erosion could occur, particularly through transverse cracks in the crests of dams. The new bulletin would add to the ICOLD guidance in Bulletin 164 on internal erosion in dams and levees.

   The Committee agreed to proceed with the bulletin. A timeframe of approximately 3 years was required to prepare a draft of the bulletin, which includes compilation of case history information. A selected working group agreed to assist in compilation of the draft of the bulletin. Robin Fell has also agreed to be co-opted to assist given his extensive experience in this field.

3. **Bulletin on Asphaltic Core Rockfill Dams (ACRD):**

   Prior to the committee meeting, the bulletin was sent out to the National Committees for comment. Comments were received by Australia and Netherlands.

   A further round of amendments would be made to the bulletin and then submitted to the ICOLD Executive for approval for publication (the bulletin is close to publication).

   Weibiao Wang presented further information on the behaviour of ACRD. This included records on internal strains within the asphaltic core embankment and overall embankment deformation.

   This embankment type is gaining in popularity largely driven by cost effectiveness over other embankment types. Previously (past 20 to 30 years) they have been constructed primarily in areas where there is a lack of suitable core materials, poor weather conditions that impact time for construction and very cold weather conditions where frost heave is an issue. Due the relatively quick construction timeframe and advances in machinery technology (and quality control), these dams now have a broader application. Countries that have built these types of dams included Canada, Norway, Sweden, Germany, China and Middle East.
4. **Bulletin on Internal Erosion (presented by Rodney Bridle):**

Bulletin 164 on Internal Erosion was published in English and French in 2017. A number of workshops have been held in Europe to present the bulletin (including the 25th ICOLD European Working Group on Internal Erosion (EWGIE) meeting held at Deltares, Delft in 2017). There are upcoming workshops and meetings including the 26th EWGIE in Milan (September, 2018) and 9th International Conference on Scour & Erosion in Taiwan (November, 2018). The 2019 EWGIE will be in Ottawa and part of the ICOLD congress (June 2019).

Volume 2 (case history information) has been approved for preprint and is presently in translation. This will be published as a separate bulletin.

5. **Coffer Dams Walls (presented by Dave Paul):**

Dave Paul (USA) proposed a new Bulletin on Coffer Dams, which was well-supported. Most members thought that the owners should take responsibility for setting design standards. An outline would be presented next year.

6. **Session on Cut-off Walls (chaired by Dave Paul):**

Dave Paul (USA) chaired a session on foundation cut-off walls and commented on the significant advancement since the ICOLD Bulletin 51 (1985) on “Filling materials for watertight cut off walls”. Bulletin 150 (2010) “Cut offs for dams” also discusses cut-off walls. There was some discussion on the potential for an updated Bulletin (to be presented further at ICOLD 2019). A number of industry guides will soon be available and these include:

- Guide to Tremi Concrete for Deep Foundations is in preparation and likely to be published later in 2018 or early 2019 published by EFFC/DFI (European Federation of Foundation Contractors/ Deep Foundations Institute).
- A guide is in preparation for support fluids (bentonite and polymers) and likely to be published in 2019 (published by EFFC/DFI).
- A guide is in preparation for plastic concrete.

Maurizio Siepi (TREVI) and John Copeland (CCMJ Systems) presented on new technology for slurry (diaphragm) wall joints and installation of reinforcing in secant columns and cut-off walls.

7. **Other Information and Presentations**

George Dounias (Greece) reported on the session on “Embankment dam behaviour – prediction of arching and cracking potential” from the 14th Benchmark Workshop of the ICOLD Committee on Computational Aspects of Analysis and Design of Dams (2017). He commented that the various models gave good agreement for stresses during construction, but predicted lower levels of arching and stress distribution across the core than measured. The overall lesson is to recognise that models can help to understand likely stresses and deformations, but do not yet make precise predictions.

Cassio Viotti (Brazil) gave a presentation on Interfaces between embankment and concrete dams.

Dave Paul (USACE, USA) presented an update on Mosul dam rehabilitation works. The dam is 30 years old and a program of grouting of the foundation has been required since construction to manage the dissolution of the foundation. 18 months of grouting have been undertaken by USACE and Dave Paul presented the results of the grouting (a single line grout curtain had been installed and they were about 25% along for a second upstream line). He commented that gypsum caves present a significant piping risk and a challenge for grouting. OPTV (a form of downhole camera) showed footage of these gypsum caves, and confirmed that they were not continuous pathways upstream to downstream.

John France (AECOM, USA) presented on the spillway incident at Oroville Dam. John led the forensic investigation of the incident and he gave an overview of the incident and the findings of the forensic investigation. Key messages were (as outlined in the report):

- “The Oroville Dam spillway incident was caused by a long-term systemic failure of the California Department of Water Resources (DWR), regulatory, and general industry practices to recognize and address inherent spillway design and construction weaknesses, poor bedrock quality, and deteriorated service spillway chute conditions”.
- “Normalisation” of cracking and underdrain flows: Initially described as “mystifying”, thereafter accepted as normal behaviour.
- Poor detailing of chute slab particularly with the under-drain detail, led to cracking in the chute slab and entry of water below the slab.
• Failure because of water injection through cracks and joints in slab leading to uplift of a section that resulted in the rapid progression of the chute failure.
• Shortcomings of Potential Failure Modes Analysis.

Gavan Hunter
ANCOLD Representative

COMMITTEE F
ENGINEERING ACTIVITIES WITH THE PLANNING PROCESS FOR WATER RESOURCES PROJECTS (2014-17)

In some regions of the world, life and economic development are at risk due to the balance between water demand and the resources available. Meeting the demand requires flows by means of natural channels (rivers) and artificial channels (canals and pipelines), as well as natural storage (lakes and aquifer) and artificial storage (reservoirs and urban storage). It is also possible to increase the availability of resources using industrial processes, such as desalination of sea water or the regeneration and reuse of treated wastewater.

The assessment of any activity in the area of water resources, and particularly in building reservoirs, must also include consideration of its environmental, social and economic effects. Today, it is generally accepted that infrastructure relating to water resources should be analysed under the framework of the river basin management plan, with adequate participation, which is undertaken on addressing each particular project. Also sustainability objectives now more than ever encourage medium and long-term consideration in the assessment of effects and in the use of resources, with the aim of ensuring their continuance for future generations. This includes adaptation to climate change, which entails trying to reduce impact associated with the long-term impacts of climate change by undertaking short-term action.

The committee’s original position paper covers a lot of these issues and is available on the ICOLD website. This position paper presented a new and improved planning process for water resources projects that is more comprehensive, transparent and is based on a vision for future sustainable water resources development. It has an eight step approach known as “Comprehensive Vision Based Planning” (CVBP) and was established to set the stage for and drive implementation of sustainable water resources projects. It is based on the strategic plan for water resources, regional visions and the watershed goals. To ensure transparency, it includes stakeholder participation and public involvement. It also incorporates both demand-side planning and the traditional supply-side planning. It also integrates a significantly greater level of engineering and cost estimating to ensure that realistic alternatives are developed with accurate and reliable cost estimates.

Further work is progressing around Multi Criteria Assessment (MCA) of water resource project and the importance of this in the planning and selection of options. Progress has been slow in 2017/18 and therefore there is little further to report on this work. However, in parallel to this International Committee work, the Spain National Committee, through their Committee on Engineering Activities in Water Resource Planning, has developed a document entitled Reservoir and Water Planning: Main Issues, which was shared with the ICOLD Committee. The aim of this document is to explain and analyse this issue with a comprehensive approach, considering a series of technical, economic, social and environmental matters on the role of reservoirs and related dams in water planning in Spain. It not only takes into account new reservoirs, but also the adaptation and, where appropriate, the decommissioning of those currently used. The document covers the following key areas:

• Technical Aspects – integrated management of water resources; managing extreme events: droughts and floods; managing risk and uncertainty: preventative and precautionary; research, development and innovation.
• Economic Aspects – the role of reservoirs in Spanish economic activity; financing and investment in the water cycle; cost-benefit analysis of a general scope; recovery of cost.
• Social Aspect – the social impact of reservoirs; solidarity and fairness; public participation; transparency.
• Environmental Aspects – maintenance of ecosystems; ecological flows; climate change; continuity of the river source.

For those interested, a copy of this document is available.

Finally, I have decided to step down as the Chairperson for this technical committee, but will remain a committee member. As a result Albi Hama from Mali will now be the Chairperson of this committee and Johanne Bibeau from Canada the Vice-Chairperson.

Richard Herweynen
ANCOLD Representative
COMMITTEE G
ENVIRONMENT (2015-17)

JAPAN has been active in developing specific technical aspects of water quality models from the previous TOR and presented further information during the meeting. The Committee has recommended that this information be subject of a technical paper to be presented during ICOLD 2019 as a conference paper.

Pleasantly, Korea, Canada and Russia have recently joined this Committee.

At the USSD Annual Conference in May 2018, Tracey Williamson and Blaine Dwyer presented the work and publications that ICOLD are developing, along with the Joint ICOLD and World Bank Workshop on Climate Change conducted at the July 2017 ICOLD meeting in Prague and ICOLD’S collaboration on the World Bank’s hydropower climate resilience guidelines.

The Committee believes that it would be beneficial for Members to deliver similar presentations in their countries to raise awareness of the ICOLD environment programme and share international practices that will provide greater opportunities for effective interface with international practitioners.

The Committee agreed that each study case which have been received or will be received during the coming year will be reviewed by two selected reviewers, so that exchanges can happen during the year. These draft case studies are due January 2019 to facilitate that the completion of the review process by June 2019.

Steven Fox
ANCOLD representative

COMMITTEE H
DAM SAFETY (2015-18)

1. Terms of Reference

Since the term of the committee ends at the Annual Meeting in Vienna the CODS Chairman submitted to General Assembly in Vienna a request to extend the Committee for the period of 2018-2021 with the following Terms of Reference:

1. Keep in contact with Chairmen of other ICOLD Committees in order to insure coherent works and publications concerning dam safety.
2. Liaise with international agencies and Committees of ICOLD member countries, according to the needs.
3. Coordinate transfer of dam failures database to the ICOLD Website and continue collecting information on dam failures.
6. Prepare guidance on assessment of consequences resulting from dam failure.
7. Prepare guidance on development of dam safety regulatory frameworks involving both national and multinational cases (transboundary basins).
8. Develop generic dam safety guidelines (a document that can provide basic information for countries in urgent need of addressing dam safety).
9. Global comparative study of the legal, regulatory and institutional frameworks for dam safety management

2. Update on Information Collection on Dam Failures – presentation available

M. Poupart informed the Committee about the progress in collecting available data on this subject and the discussion within the Working Group regarding the updating of Bulletin 99. Working Group proposes to initiate the updating work and the Chairman will ask the President to add this task to the Committee TOR at the earliest opportunity. The preliminary work plan of the Working Group includes review of fundamental definitions and review of failure cases (see Appendix E).
3. **Assessment of Consequences or Hazard Potential Resulting from Dam Failure – presentation available**

Progress report was delivered by Shane McGrath (Working Group lead) who provided information on ongoing efforts. The purpose of this Bulletin is to provide guidance for dam managers on suggested principles and the contemporary applications and methods used for consequence analyses. The objectives of this bulletin are to:

1. Support dam managers to make informed decisions regarding the need, purpose and scope for consequence analyses; and

2. Provide a basis for building a common understanding between dam managers and technical providers in specifying, and then interpreting the results from, consequence analyses.

While the bulletin is structured to meet the purpose and objectives stated above, the content may also provide professionals engaged in the various analytical activities insights into the context and purpose that their work supports.

4. **Review of Current Practice of Risk Assessment and Management for Dams**

Andy Zielinski lead of the Working Group provided the Committee with the update on activities following the Prague meeting of the Committee. Following initial and exploratory Survey I sent to CODS members, the candidate countries for more detailed Survey II were identified.

The list includes nineteen (19) member countries represented in the Committee. The discussion which followed the presentation is briefly described below.

It concentrated on the scope of the review and led to the conclusion that the review should include broad spectrum of practice in the area of risk assessment and management for dams. It was also agreed that in order to clarify the boundaries of this spectrum, the Survey II technical questions will be preceded by an introduction explaining the importance of the political, legal, regulatory and institutional context impacting the choice of the risk assessment and management framework. The Working Group will meet in Vienna following the Committee meeting and will develop the work plan with the objective to prepare and send out the Survey II in the early fall of 2018.

5. **Global Dam Safety Study – presentation available**

The topic was introduced at the CODS meeting in Johannesburg. The study has completed the collection of case studies from 51 countries and is currently finalizing comprehensive report outlining results of comparative analysis of current arrangements is countries surveyed. The report will also provide recommendations and guidelines for suitable dam safety arrangements, as well as frameworks and options for sustainable Dam Safety Management programs.

6. **Generic Dam Safety Guidelines and Guidance for Regulation of Dam Safety**

Robin Charlwood hosted a discussion focused on benefits of the proposed Bulletin and its shortcomings following presentations. The conclusions from the presentations and discussion can be summarized as follows:

- Robin Charlwood and the Working Group team will consider the suggestions that have been made, and which ones they think would be improvements to the current draft document. Improved document will be provided to the CODS members for review by end of August 2018.
- After review, CODS will decide whether they will recommend the Bulletin for ICOLD publication.
- If the decision of the CODS is not to submit the new draft as the CODS Bulletin Working Group will disseminate the document outside of ICOLD through Eastern Nile Technical Regional Office (ENTRO). CODS will consider establishing a new working group to develop generic dam safety guidelines with a focus on simplifying Bulletin 154. The concept, terms of reference and members for that working group would need to be determined.

7. **Current Practice of Risk Assessment and Management for Dams**

The aim of this work is to prepare an update of Bulletin 130 on risk assessment. Member countries have provided feedback to the working group on who are the key regulators, practitioners and owners using risk assessment. The next step will be to hold an international workshop of invited attendees where details of the use of risk assessment in the various jurisdictions can be assessed.

**Shane McGrath**

ANCOLD Representative
Sub-committee of the ICOLD committee on Dam Safety

ICOLD has a sub-committee of the committee on Dam Safety in the process of updating the ICOLD data base on dam failures and preparing a new Bulletin on the statistics of dam failures. The committee is not interested in reporting on the question of incidents. Following a request from the ANCOLD Executive I have been working with the ICOLD Committee on that task. Michel Raymond and I attended a sub-committee meeting in Vienna in July to discuss progress. The aim of this sub-committee is to have a new Bulletin prepared for approval by ICOLD at the meeting in Ottawa in 2019.

Robert Wark

COMMITTEE I
PUBLIC SAFETY AROUND DAMS

TERMS OF REFERENCE (2016-2019)

DELIVERABLES

1. Prepare an ICOLD Technical Bulletin on Guidelines for Public Safety Around Dams which includes such aspects as; hazard identification and risk assessment, universally recognized symbols to mark public safety hazards and self-assessment tools. The guidance is to address a broad spectrum of dams including hydropower structures and low-head weirs.

2. Consider the issue of Public Safety Incidents including:
   • The establishment of clear criteria describing public safety incidents and a format for reporting to be applied by the National Committees and organizations wishing to track the occurrences in a consistent manner.
   • Development of a database encompassing public safety incidents

3. Support the Committee ‘N’ on Public Relations for the preparation of information and education documents concerning public safety around dams

Deliverable 1 – Development of a Technical Bulletin on Guidelines for Public Safety

During the past year the Committee established a framework for the development of what will now be a series of 5 complimentary ICOLD Technical Bulletins which will achieve the first element of its mandate to develop Guidelines for Public Safety Around Dams. Taking this approach will result in a logical sequence of Bulletins which respects ICOLD’s criteria to preferably maintain documentation which is under 100 pages in length. The framework includes Bulletin 1 - a ‘parent’ document outlining the principles and elements contained in the remaining four Bulletins – Public Safety Assessment, Technical Applications, Incident Management and Performance Assessment.

Working Groups have been established for each of the Bulletins with monthly conference call meetings set-up to report on progress throughout the year.

The State of Practice report has effectively been completed with edits continuing to improve the readability and condense the materials. The State of Practice report includes input through a survey with 43 ICOLD Member National Committees responding regarding their practices to protect the public from activities near to dams. The Committee will seek comments from the National Committees and plan to present the final document for approval at the ICOLD meeting in Ottawa in 2019.

In the next year the Committee will focus on three (3) deliverables; i) issuing the State of Practice Report to the National Committees for approval; ii) advancing the draft Technical Bulletins for Public Safety Around Dams; and, iii) completing a report documenting the analysis of the data collected in the Incident Database.

Deliverable 2 – Development of an International Database

Considerable progress has been made towards developing a database of public safety incidents. This has included establishing a framework, specific data fields, and populating the database with over 1000 public safety incidents, which serve to document over 1000 fatalities and a similar number of near misses. Data fields include details related to the location, dam type, activity at the time of the incident, victim information, rescue methods, human factors, and follow up actions. This is the most comprehensive database of its kind.

Analysis of the data from the more than 1000 case studies was presented during the Committee meeting. Over the course of the next year further analysis of the data will be undertaken, the results of which will provide valuable insight, informing future initiatives of the Committee.
Presentation
Committee Chairman Tony Bennett gave a presentation on the work of the committee to the General Assembly. A copy of this presentation is available.

Shane McGrath for Angus Swindon
ANCOLD Representative

COMMITTEE L
TAILINGS DAMS & WASTE LAGOONS (2014-17)
The committee met in Vienna on Sunday 1st July 2018.

Business included:

1. Bulletin Tailings Technology Update is ready for Member Country review. Committee members to distribute to appropriate people for review.
2. Tailings Dam Register – Australia are coordinating and have had some success but need to remind member countries to respond;
3. Canadian Dams Association has started a register of dam incidents
4. Two new Bulletins proposed – Surveillance and Monitoring of Tailings Dams and Tailings Dam Safety Guidelines. The latter is intended to be a global document to set out minimum standards. Hope to get these Bulletins out by end 2019.
5. ICOLD 2019 in Ottawa and members asked to consider submitting a paper.
6. Presentations by attendees
   a. Australia presented on new Guidelines on Earthquakes and conflicts with Tailings Guideline and briefly discussed Cadia TSF Failure
   b. Brazil discussed new Standard being developed and increase in filtration projects
   c. Chile reported on a workshop on simulation modelling for tailings dam failure
   d. China reported on new 5 year plan to include focus on technology to prevent large scale dam failures and new Technical Regulations for Tailings Ponds being revised with new limits on expansion and raising of dams. In addition flood limits have been increased and dams with residents within 1km downstream have been particularly identified for safety review. China has developed a mobile tailings grading machine.
   e. UK reported on a new EU Directive TC396 Earthworks work plan and the European Standard - Hydraulic placement of extractive waste which includes descriptions of non-standard tests that are useful for tailings.
   f. Russia reported on new State dam monitoring department that will have responsibility to monitor tailings dams;
   g. Slovakia reported on their 62 tailings dams and tailings dam register;
   h. South Africa reported on the continued downturn in the mining industry but possible turn around with new Government;
   i. Sweden reported on growing awareness of dam safety and shortage of skilled people;
   j. USA reported on workshop on lessons learned and developments in formalisation of a position on Engineer of Record;

These presentations are available.

David Brett
ANCOLD Representative
COMMITTEE M
OPERATION, MAINTENANCE AND REHABILITATION OF DAMS (2015-18)

Two presentations were provided; one outlining the rehabilitation of the 105-year old Klingenberg Masonry Dam in Germany, involving extensive dam, spillway and outlet works and another from Mr John France with lessons from the USSD/ASDSO Expert Team on the Oroville Spillway Incident forensic study.

ToR 1 (Recommendations for the Operation, maintenance and Rehabilitation of Dams) has been completed and translated to French and has been be published as Bulletin 168. This document is now available on the ICOLD website.

ToR 2 (Investigation and Rehabilitation under Full Reservoir Operation Conditions) A decision was made to separate Rehabilitation and Investigation sections of the current draft bulletin (Underwater Inspection and Construction) into two separate bulletins. The Rehabilitation section the highest priority and the goal is to have a completed draft reviewed by Committee M members for Ottawa ICOLD 2019 meeting.

The bulletin has several case studies that are being updated along with new case studies that will be developed by Switzerland, Italy, Japan, Germany, China and France.

ToR 3 (Operation of Hydraulic Structures) has been submitted to ICOLD and will become Bulletin 175.

Steven Fox  
ANCOLD Representative

COMMITTEE O
WORLD REGISTER OF DAMS AND DOCUMENTATION (2017-20)

At the request of the Executive, I have been nominated to maintain contact with the ICOLD working group on the World Register of Dams. The next update will be due for completion in 2020, although the updating is a continuous process. The current version now contains location information and the next version should contain updated data on catchment areas.

Robert Wark  
ANCOLD Representative

COMMITTEE Q
DAM SURVEILLANCE (2015-18)

The sixth meeting of the Committee on Dam Surveillance was held in Vienna and was attended by 21 of a total of 25 members, 2 co-opted members and 17 part-time observers.

The first Bulletin of the Committee examines dam surveillance lessons learned from eighty case histories. The Bulletin is substantially complete with only a small number of editorial comments received from National Committees to be incorporated. The Bulletin will then be formatted and translated in anticipation of its approval at the next Annual Meeting in Ottawa. This may also include presenting the bulletin at a technical workshop in conjunction with the symposium.

A second bulletin is being commenced and will address acquisition and interpretation of dam surveillance data and observations. It is intended that the Bulletin will incorporate chapters on:

- Methods for the improvement of the quality and reliability of data/information
- Data processing and representation techniques
- Effective diagnostic analyses to determine behaviour patterns

The Committee continues to debate the extent to which the bulletin should address capacity building and training of surveillance technicians and dam operators and software tools and hardware, both of which are covered in earlier bulletins. The Bulletin is likely to cover some emerging technologies such as the use of fibre optics to detect seepage within embankments through measurement of heat transfer differential due to changing soil moisture.

The term of the Committee was extended to 2021 at the previous Annual General Meeting.

Andrew Reynolds  
ANCOLD Representative
COMMITTEE S
ON FLOOD EVALUATION AND DAM SAFETY (2015-18)

The committee met in Vienna on Sunday 1st July 2018 and ANCOLD was represented by Peter Hill. Michel Raymond from the ANCOLD Executive also attended as an observer.

An update was provided by Brian O’Mahony on the legal action arising from the 2009 River Lee floods in Ireland. In November 2009 there was extensive flooding in Cork which is downstream of the Carrigadrohid and Inniscarra dams. Despite the dams having no formal requirement for flood mitigation and the spillway gates being operated appropriately with outflow less than inflows, a case was taken against the dam operator. The Commercial Court (branch of High Court) found that the dam operator was liable for 60% of the downstream damages. This decision has now been reversed by the Court of Appeal and ESB was found not guilty.

Presentations were also made by

- Dr. Luis Berga (Spain) on Synthesis about extreme floods (peak and volumes)
- Emmanuel Paquet (France) on Extreme reservoir levels estimation by stochastic simulations – Application to three dams of the Verdon river
- Alan Warren (United Kingdom) on Extreme flood estimation research for the UK
- Y. Huang (China) on River Management under Changing Environment

The committee is preparing a new Bulletin on Flood Evaluation, Hazard Determination and Risk Management with the following chapters:

1. Effect of combined hydrological events
2. Role of flood volume
3. Stochastics approach to flood hazard determination
4. Forecast for proactive flood risk management.

The Bulletin is expected to be completed by June 2019 with a workshop proposed as part of the next ICOLD meeting in Ottawa.

Peter Hill
ANCOLD Representative

COMMITTEE V
HYDRO-MECHANICAL EQUIPMENT (2014-17)

The bulletin under preparation is titled “Best Practices for Achieving Reliability of Flood Discharge Gates”. A 2nd draft of the entire bulletin was presented and discussed in detail at the meeting. Changes were made to the chapter titles and their content and sequencing to improve the readability of the bulletin. A glossary containing relevant terms and a list of references are being added.

A new chapter has been added containing a suggested list of good practice principles.

The chapter on gate incidents and failures is continually being added to with new material as it becomes available.

It is planned to have a final draft ready for submission to the central office by early 2019.

No decision has yet been made on the topic for the next bulletin.

Ian Landon-Jones
ANCOLD Representative