



ACTION PLAN ON CAPACITY BUILDING

Ad-Hoc Committee on Capacity Building (CBC)

December 2016

**AD HOC COMMITTEE ON CAPACITY BUILDING IN DAM ENGINEERING
(2009 – 2017)**

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FOREWORD

The Capacity Building Committee is an Ad hoc committee established on 2009 during the Annual Meeting held in Brasilia. The purpose of this committee is to handle the training programs launched since 2006 with the support of Turkish Committee on Large Dams (TRCOLD) and DSI of Turkey for training of professionals from the ARC in Turkey and later, with support from Morocco for training in Morocco and China with the annual workshop and technical tours. The second task of the Committee is to organize a survey within ICOLD country members for the assessment of capacity building needs and following this survey to prepare a capacity building vision and action plan. The aim of this work is to enable ICOLD to have a systematic and comprehensive vision and integrated actions to strengthen ICOLD and its members country committees and in general to enhance the capacity of professional members of ICOLD to handle the process of Dam engineering, construction operation and safety management.

Capacity Building has been at the heart of ICOLD activities since its creation in 1928 with the main purpose at that time to improve the safety of large dams with huge potential risk to downstream populations, infrastructures equipment and ecosystems.

ICOLD has focused in this last decade on the promotion of dams and reservoirs development worldwide and specifically In less developed countries mainly Africa to address the critical challenges in term of access to water supply, sanitation, food security, clean and cheap electricity and safety and adaptation to global change including climate and world population growth with the associated demand for better life conditions.

The need for capacity building in the less developed countries, where the main developments will occur in the future, is a critical aspect for our organization goals. The expected trend in the development of water storage and energy infrastructures is occurring now and will improve in the future. There will be a strong and widespread demand to prepare professionals to handle, appropriately, the process of planning, design, construction, and especially the operation and maintenance of these new structures, to ensure their safety. In parallel the survey also showed that capacity building is a common issue and concern within ICOLD committee's members as even in developed countries there is a decline in term of human resources and difficulties to ensure the sustainability of the profession and the need to address ageing infrastructures and renewal problems.

The document presented here is the result of the works of the committee which conduct several training programs in parallel with the preparation of the Action

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Plan. Due to the instability of the membership of the committee and due to the difficulty to change its composition the work took more time than scheduled at the beginning.

After the evaluation of the role of ICOLD in capacity building in the past and current situation the action plan has identified the key issues in term of capacity building and key actions to address these needs. The actions are then planned for more detailed development and implementation in the future.

I would like to thank all the committee members and observers who were very active in contributing to achieve the present result. A special mention has to be made for the contribution of Eng Femi secretary of the Committee and Herb Hawson, Sergey Yuriev to the preparation of the action plan presented herein. The draft document were presented in the knowledge transfer workshop organized in Johannesburg to share the proposal with a large public of ICOLD professionals and to get input for the finalization of the Action Plan. This document is for ICOLD a policy paper and a plan for the capacity building aspects of its activity.

Adama NOMBRE

Chairman

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PREAMBLE

The International Commission on Large Dams (ICOLD) was founded in 1928 as a non-governmental international organization which provides a forum for the exchange of knowledge and experience in dam engineering. At present, it has National Committees from more than 90 countries with approximately 10 000 individual members.

In recognizing the desire of developing and less developed countries to increase their dam development, ICOLD had encouraged them to become members. ICOLD had also placed a lot of emphasis in assisting the new members develop their dam technology skills through the organization of capacity building programs, participation in ICOLD technical committees and ICOLD events.

Although the initial focus was on developing and less developed countries, it soon became apparent that there was also a need in developed countries whose dam development programs were thinning out leading to declining human resources in dam engineering. With the need to renew and maintain ageing dams in developed countries, came also the need to build capacity in the renewal and maintenance of ageing dams.

The issue of capacity building as a specific activity within ICOLD started to emerge in 2006 and gained importance as a key to contributing to the development of the huge potential of water and energy for sustainable development in the world. ICOLD therefore decided to formulate the Ad Hoc Committee on Capacity Building in 2009 to coordinate activities in Capacity Building within the framework to achieve ICOLD's goals in knowledge exchange and strengthening of the capacity of the national country members.

In 2006, ICOLD started to implement a program of training for young professionals of developing and less developed member countries. These training programs have been hugely successful and highly sought after by developing and less developed member countries. Very recently there have been requests from developed country members for similar programs to suit their own needs

This report, is based on a capacity needs assessment of ICOLD members, gives a background to ICOLD, reviews existing programs and provides an action plan for the way forward.

INTRODUCTION

The International Commission on Large Dams (ICOLD) is an international non-governmental organization that provides a forum for the exchange of knowledge and experience in dam engineering. ICOLD was created in Paris in 1928. Today, ICOLD membership consists of 97 member countries (which accounts for about 90% of the world's population) and more than 10,000 individual members. ICOLD leads the profession in setting standards and guidelines to ensure that dams are built and operated safely, efficiently, economically, and are environmentally sustainable as well as socially equitable.

Some key Capacity Building issues facing ICOLD include the following:

- Assist nations to meet the challenges of the 21st century in the development and management of the world's water and hydropower resources.
- Promote professionalism and ethics in dam engineering;
- Encourage the transfer of knowledge among countries;
- Promote training courses, workshops and technical tours;
- Encourage young people to participate in the activities of ICOLD and in the National Committees;
- Advance knowledge in adaptations to climate change and their impacts on water resources, dams and reservoirs;
- Expand knowledge in dams, environment and social aspects and in dam safety.

ICOLD since its creation in 1928 has been a powerful tool for capacity building in dam engineering. ICOLD as a leading dam international organization provides an international forum for the exchange of knowledge and experience through its international congresses held every three years which brings together thousands of professionals worldwide and through its international symposiums and workshops related to dam engineering, construction, operation, monitoring and decommissioning, environmental, financial, social aspects and safety of dams and reservoirs. ICOLD also provide guidelines and recommendations for professionals and decision makers as well as publish technical bulletins on dams and related issues. Hundreds of technical bulletins are available with free access for ICOLD members on the ICOLD website. The website is www.icold-cigb.org and www.icold-cigb.net

With the increasing number of members from developing countries mainly from Africa, the issue of capacity building as a specific activity within ICOLD started to emerge and gain importance as a key to the development of the huge

potential of water and energy for sustainable development mainly in the developing countries but also generally in the world.

Also in developed countries where many dams had been built in the past there is the need to maintain and renew these infrastructures. However, since the 1980s there had been declining human resources to satisfy these needs, thereby making it one of the challenges of capacity building within ICOLD. Consequently, capacity building is a common theme in all national committees of ICOLD.

It is in this context and to achieve ICOLD goals in knowledge exchange and strengthening of member countries that ICOLD started in 2006 to implement a program of training for professionals from developing countries. To develop this program as well as others there was the need for a team to coordinate and organized the required activities which led ICOLD to set up the Ad-Hoc Committee on Capacity Building.

ICOLD AD HOC COMMITTEE ON CAPACITY BUILDING (CBC)

Role and Tasks

The following members make up the Capacity Building Committee (ICOLD Committee Z): **Adama NOMBRE-Chairman** (Burkina Faso); Dr ALI NOORZAD **Vice-Chairman (IRAN)** Femi SONUGA-**Secretary** (Nigeria) and other **members** included, SERGEY YURIEV (Russia), Dr XU ZEIPING (China), HAMIDOU KEBE (Mali), LHASSAN BOUFOUSS (Morocco) Replaced by KHALID EL GHOMARI (Morocco), Hasan. Basri. YUKSEL (Turkey), Dr. Kevin. WALL (SOUTH AFRICA) and **Observers**, IMO EKPO (NIGERIA) and Herb HAWSON (Canada) participated in most meetings and the work of the committee.

The main tasks for the committee were established in a "Terms of Reference" issued to the Committee in 2009, it included the following:

- Conduct a survey of the National Committee of the countries involved so far to gauge the ongoing benefit or otherwise and seek their opinion on the value of continuing the capacity building program;
- Assess the capacity building needs in Dam engineering of ICOLD National Committee member countries;
- Evaluate the role and contribution of ICOLD to capacity building in Dam engineering;
- Carry out a comprehensive analysis of capacity issues within ICOLD and its member's committees;
- Prepare and develop an action plan of ICOLD for capacity Building in Dam Engineering;

- Conduct consultations with potential ICOLD member countries and multilateral institutions to mobilize support for implementation of the action plan.

During the period of the development of the Action Plan, the CBC also had to plan, coordinate and organize all ICOLD programs and initiatives in the field of capacity building. These included the ongoing training programs in Morocco, China and Turkey as well as providing links and connections to other specialized training programs.

KEYS ISSUES AND CHALLENGES OF CAPACITY BUILDING FOR ICOLD AND ITS NATIONAL COMMITTEES

Capacity Building Needs Assessment

To better understand the capacity building requirements of the member countries, determine the current state of skills, knowledge, abilities, the gaps and needs of the member countries, a NEEDS ASSESSMENT was carried out. This was done through a series of questionnaires. The initial response was very scanty and took very long as several member countries did not think it pertained to them. Following a series of appeals and the Capacity Building session at the AFRICA 2013 conference the response became more robust. Furthermore, the Capacity Building committee also had access to similar needs assessment surveys carried out by other institutions including the African Development Bank. A review of the needs assessment survey revealed the key issues and challenges of capacity building for ICOLD and its national committees and became the basis of the action plan. These needs include:

- Building and strengthening of the Dam profession in Developing Countries;
- Building capacity in less developed countries for the development of dams and reservoirs;
- Renewing and developing the profession in developed countries;
- Dissemination of Knowledge;
- Promotion of the Profession and attracting young professionals to the dam profession;
- Implementation and funding of Capacity Building Programs.

Building and Strengthening the Dam Profession in Developing and Less Developed Countries

ICOLD and its National committees have played an important role in the progress and development of dams and reservoirs planning, construction

operation and maintenance including Dam surveillance and safety activities since its creation in 1928. In Europe, America and Japan, ICOLD has led the profession in the implementation of Dam projects since the early 1930s. Under this leadership and guidance from ICOLD these countries and regions have been able to develop their water and energy infrastructures for the benefit of their people as well as to advance techniques and materials for improved dam development. From the 1980's till the present, the same progress occurred in Asia mainly China, South America (Brazil) and some emerging countries like Iran, Turkey etc. The ICOLD membership has increased accordingly and today the development is occurring now mainly in South East Asia and progressively in Africa. There is an important need for the profession in these regions to be organized and incorporated into the ICOLD. This would allow these regions benefit from the immense knowledge, state of the art techniques as well as get the best guidance in the profession for the planning, implementation and operation of their Dams.

Many developing countries have not yet organized their Dam Sector and are not members of ICOLD. Many new national committees from developing and less developed countries need to strengthen their capacity to be able to play their role and lead the profession in their countries in the implementation of the huge dam programs planned for development. For example, in Africa there are around 27 member countries of ICOLD out of a total of 57 countries and many of these countries with important dam programs don't have an ICOLD committee. Many National Committees are also very young and their structures are still weak and need to be urgently and rapidly strengthened.

The Capacity Building committee has been providing advice to these new National committees as well as providing training programs.

The need for capacity building in the dam's profession is critical today in developing and less developed countries as the coming decades will see the development of new dams sited in these countries especially in Africa.

Needs assessments carried out show that knowledge and professional development is still weak in many countries and regions of Africa with high levels of illiteracy and low availability of Water resource scientists, professionals and engineers. The situation in terms of general education and availability of Engineers is presented in the figures below:

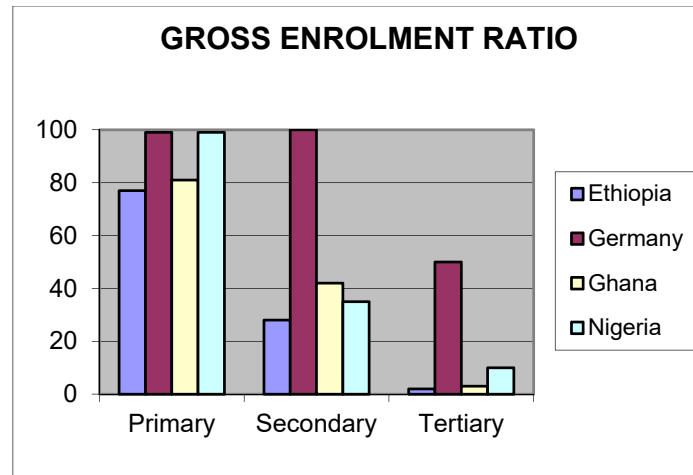
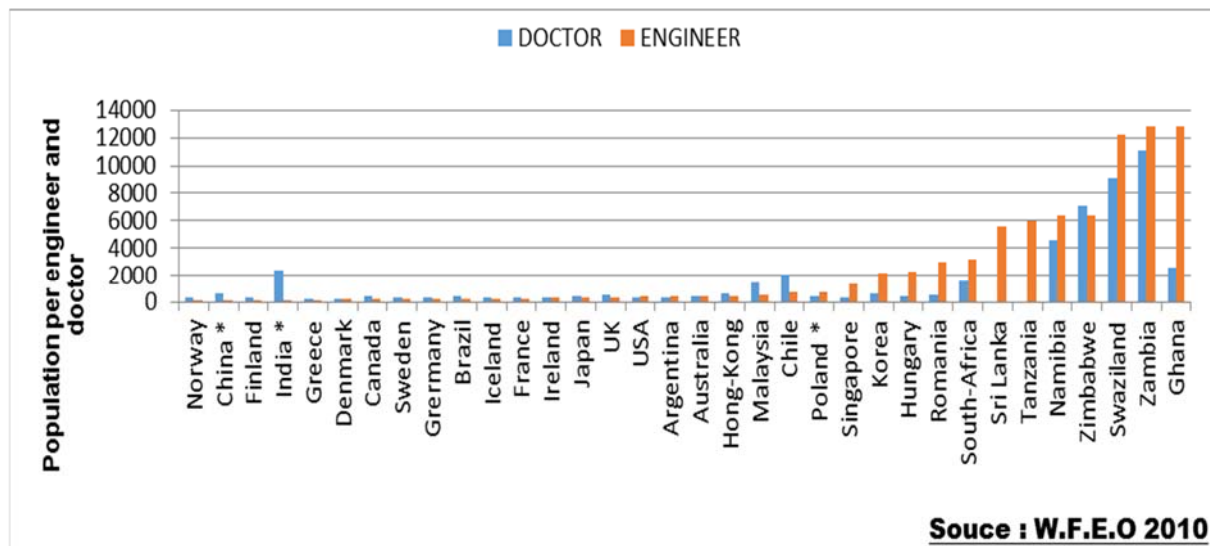


Figure 1: Gross enrolment ratio in Africa



Source : W.F.E.O 2010

Figure 2: Population per Engineer and doctors

It is strategically important that the public universities and schools of engineering be developed to ease access to brilliant young people so as to increase the rate of production of trained and qualified scientists and professionals. Continuing education and 'on the job training' should be used during projects appraisal, preparation and implementation so as to provide practical experience and knowledge transfer from International and local firms to upcoming professionals.

From the needs assessment and other reviews, it is evident that the Research and Development (R&D) sector in Africa is not receiving the necessary attention and support. R&D is very important for improvement of knowledge and technology specifically suitable to the local area and environment. The figure below illustrates the status of fund allocation to R&D for some regions of the World.

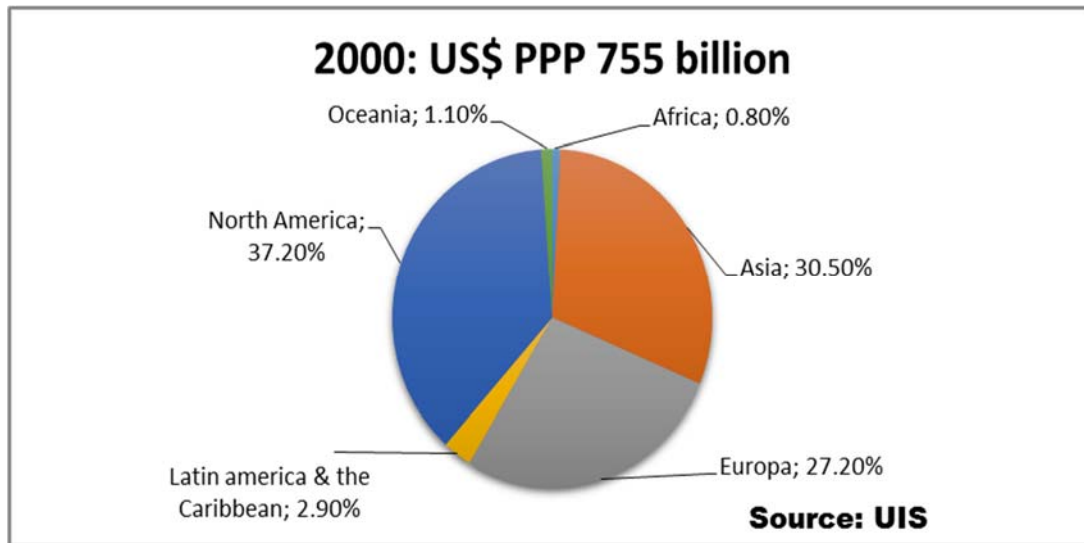


Figure 3; Fund allocation to R&D by Continent

Knowledge development is an important key for better planning of water resources leading to well-prepared, implemented and operated water infrastructure projects. This is also required to mobilize funds and also for long term development.

In general, the needs assessment revealed that the developing and less developed countries are also facing some important constraints such as

- Lack of schools of engineering in the specialities for dams and reservoirs
- Lack of home capacity to plan and handle the development of the water and energy sectors
- Weak institutional and regulatory framework
- Lack of capacity for proper operation and maintenance and to manage dam safety

Renewing and Developing the Profession in Developed Countries

In many developed countries, due to the decline in dam development since the 1980's, the capacity in the Dam profession has decreased drastically despite the need to continue operating and maintaining these huge assets. There is the need to upgrade, renew and develop innovation in the profession. Associated and connected to this, is the dam crisis of the 1990's and 2000's in which dams were seen by conservationist as being environmentally unfriendly. This made the image of the dam engineering profession to suffer leading to the profession becoming less attractive option for young people who became more attracted during this period to the banking and communications sectors. Thus, there is a great demand for human resources in

dam technology in these regions. There is also the need for the transfer of the present knowledge held by ageing professionals to the young generation to ensure the sustainability of the Dam and water resources management capability in developed countries.

Attracting Young People to the Dam Profession

The need to attract the young people into the dam profession is a worldwide issue. ICOLD over the last decade, started developing activities to encourage young engineers which has now been formalised into the Young Engineers forum. This forum is growing progressively with significant increases in membership from congress to congress.

ICOLD'S CURRENT CONTRIBUTION TO CAPACITY BUILDING IN DAM ENGINEERING

Developing State of the Art Technology

One of the main achievements of ICOLD is the dramatic improvement in dam safety. Since the 1980s, the probability of catastrophic failure of large dams has been reduced substantially, despite the strong and sometimes catastrophic weather patterns including earthquakes experienced during this period. This is the result of significant advances in dam engineering, and improvements in management of dams, including the implementation of emergency plans by increasing numbers of owners and operators in many countries.

Another important achievement relates to the assessment and management of environmental and social impacts of large water infrastructure. Modern dams are generally well planned, well designed, well implemented and well operated and maintained. Very recently, ICOLD took the initiative to encourage dam owners to include the effect of climate change in the planning techniques for new dams.

Much progress has been achieved in dam technology, materials and typology, examples include; the development of Roller Compacted Concrete Dams (RCC), Concrete Faced Rock Fill Dams (CFRD) and also in new cementitious and other materials for dam development. There has also been improvements in the capacity to handle large floods, with improvements in spillway design, flood evaluation and forecasting techniques as well as progress in the design of dams to withstand major earthquakes, climate change and other natural hazards.

Advances also include the ability to design, build and operate very high dams, with tremendous potential for hydropower production. The development of this type of dam has led to increased knowledge in material behavioral patterns under high stresses and pressures, and has created a lot of innovation in dam designs and construction.

Considerable progress has also been achieved in the management of sediments which allows for the long-term conservation of reservoir storage capacity. Sedimentation aside from being a key issue in reservoir management is also critical threat to the sustainability of storage in many parts of the world. Thus progress in this field will allow for a major improvement in the conservation of storage capacity, and the enhancement of benefits from these structures.

Progress has also been made in improving the methods for monitoring dams. This knowledge allows a more accurate assessment of the current conditions of dams. New technology has also allowed the remote monitoring of dams, all these leads to increase reliability and safety of dams.

Disseminating knowledge

The congresses and symposiums (symposia) organized by ICOLD are important forums (fora) for the sharing and exchange of knowledge and experience. Through these activities ICOLD has develop the profession worldwide. ICOLD has disseminated the output from these forums through its bulletins, publications, dam registers and the ICOLD web site where a large amount of information resides.

The ICOLD board has further encouraged national committee members by allowing free access to ICOLD bulletins. This decision taken in 2010 during the General assembly of Hanoi, made it possible for thousands of engineers to have worldwide access to this important stock of knowledge, knowhow and techniques and has had a positive impact on the quality of practice in some of the developing and less developed countries.

Technical Committees of ICOLD as a Tool for Capacity Building

ICOLD Technical Committees are an important tool for the development and advancement of knowledge and state of the art updates for the whole Dam and Reservoir engineering profession worldwide. Their activities and work are at the heart of ICOLDs missions. ICOLD now has around 25 Technical committees including Ad Hoc committees working on some specific issues with

about 400 to 500 high level professionals from all regions of the world and working together to develop the knowledge base of ICOLD. The participation in general and of experts from developing and less developed countries is increasing since the increase in pace of Dam and reservoirs development in these countries. The figure below shows the trend of membership and attendance of the Technical Committee (TC) activities.

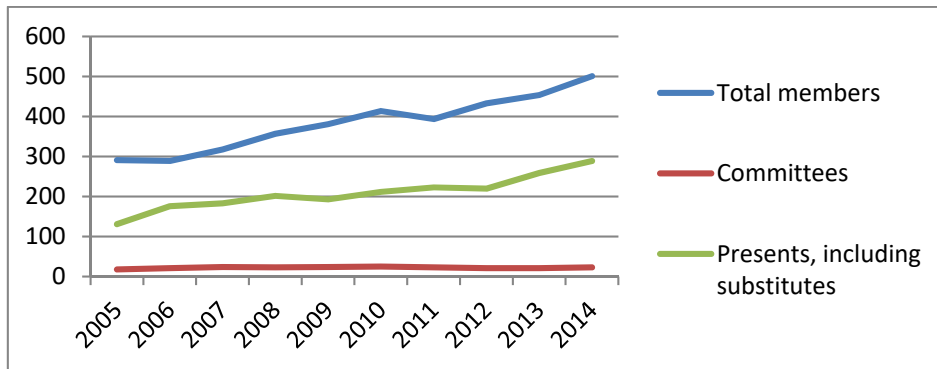


Figure 4: Evolution of the membership and attendance of TC

The work sessions of the technical committees are an important tool for capacity Building of Professionals coming from developing countries and for Young Engineers. Therefore a lot of effort is made to ease and encourage the participation of Professionals from developing and less developed countries as well as young engineers. The survey of the TC membership and attendance at TC sessions have shown that many ICOLD national committees are involved in the work of these important instruments (the committees) for knowledge sharing and development, but some effort have to be spent to improve the contribution of professionals from less developed countries.

Regional Clubs

To address regional and specific issues, ICOLD set up Regional Clubs. These are the regional organizations of ICOLD to ensure and monitor the development of the organization and the profession in the different geographical regions. The activities of the Regional clubs are also an important contribution to the capacity building of professionals and for strengthening the National committees. These regional clubs offer the possibility to more engineers and professionals to attend and contribute in ICOLD activities within their regions. Thereby allowing them to also update their knowledge and upgrade to the state of the art techniques specific to their region. Young Engineers and more professionals are able to attend these activities as they are less costly and address issues more specific to their regions and backgrounds. The current clubs include the European club which is one of the most active regional clubs, the Asia Pacific Club, the Africa Regional Club and the INCA.

Specific Training of Engineers from Less Developed Countries

In its quest to assist the new member countries develop their capacities in dam engineering, ICOLD began an initiative to encourage the training of engineers from less developed member countries by more developed member countries. The Training Program is usually based on a Framework between the Ministry responsible for Dam and Reservoirs of the member country hosting the training and ICOLD. The initiative allows members to learn from the progress achieved by the hosting country.

Training Program framework

To date Turkey and Morocco had been host to the training program whilst China had organized annual technical tours and workshops towards the training of engineers from the ARC zone.

So far the two terms negotiated by ICOLD with the Turkish Committee on Large Dams in supported by the General Directorate of State Hydraulic Works (DSI) of Turkey have been successfully completed. The Three terms agreed with the Moroccan Committee on Large Dams with support from the Kingdom of Morocco through the Moroccan Secretary of State in Charge of Hydraulics are currently still on-going.

The two training agreements had been signed for the short-term training of engineers and professionals from less developed member countries of ICOLD. The Turkey program ran for two three year terms (2006-2008 and 2012-2014), whilst the duration of the program in Morocco is also for two three year terms (2008-2010 and 2015-2017).

The training programs aim at giving participants a comprehensive view of dam development whilst focusing on water resources management, dam planning, engineering and operation.

For each program a training regulation had been signed between ICOLD and the supporting institution. In the case of Turkey, the training fees are supported by DSI and in the case of Morocco the training fees are supported by the Morocco Secretary of State in charge of hydraulics. Travel costs are supported by the national committee of the trainee. Trainees were encouraged to provide reports at the end of the program detailing the usefulness of the course, their personal observations about the lectures, training system and a general overview as well as comments on how to improve the programs for others coming behind.

Training program in Turkey

To date, six sessions had been organized for the Turkey training program. They were held in 2006, 2007, 2008, 2012, 2013 and 2014 and consists of a one-month technical tour in Turkey for up to ten (10) participants from the ARC per year.

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By the agreement, the training covers planning, finance, design, implementation and operation of dams, hydropower stations as well as associated equipment and infrastructures. Feedback from the participants indicated that the training was extremely useful and should be continued.

A total number of 35 engineers and dam professionals from the ARC had attended the six sessions organized by DSI:

Table 1: Number of Trainees and countries involved in Turkish Training program

Member Countries	No of Participants
Burkina Faso	3
Cote d'Ivoire	2
Egypt	2
Mali	5
Morocco	5
Nigeria	7
South Africa	4
Zambia	7
Total	35

These training sessions consisted of technical tours around the main regions of Turkey, visits to major dams in operation, large dam construction sites, large water systems and the historical and cultural sites of Turkey. These tours were supplemented by presentations at the General Directorate of DSI by representatives of the water and energy sectors aimed at organization and management of these infrastructures in Turkey focusing on the role and features of DSI which is the main institution for development and protection of water and energy resources of Turkey established in 1954.

This program offered unique opportunities for young engineers to have a general overview of the achievements in the water and energy sectors in Turkey and to establish networks for cooperation and friendship between Turkish professionals and the participants as well as amongst the participants.

Training in Morocco

Four sessions had been organized so far for the Morocco training program. They were held in 2008, 2009, 2011 and 2015 and consists of a three-month technical tour in Morocco.

During these three months the trainees have the opportunity to:

- visit dams in operation and be introduced to dam monitoring and surveillance techniques;
- visit dams under construction;
- visit hydraulic and geotechnical laboratories;

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- be introduced to the water management and development policy in Morocco;
- have on the job training in Consulting engineer's offices.

This program allows trainees to get an in-depth view of the water and energy sector organization and regulation in Morocco, to learn from the Moroccan experience in water and dam planning, engineering, construction and operation. Morocco is one of the active member countries of ICOLD with large experience in the field of water resources planning and dams engineering and could be an example of how water can be manage in a water scarcity country similar to many countries in the Sahel zone of Africa. To date the following countries have benefitted from the training:

Table 2: LIST of PARTICIPANTS THAT HAVE ATTENDED THE MOROCCAN TRAINING PROGRAM

Year	Number of Participants	Member Country	Remarks
2008	2	Burkina Faso	
2010	2	Togo	
		Mali	Malian Candidate withdrew at the last minute
2011	3	Burkina Faso	
		Mali	
		Nigeria	
2015	3	Cote d'Ivoire	
		Nigeria	
		Zambia	Zambian Candidate withdrew at the last minute

In 2016, it was decided to postpone the training program so that it coincides with the ICOLD Africa 2017 Regional Conference thereby enabling the participants to participate in the Regional Conference. It was also agreed with the CBC, to reduce the time from 3months to 6weeks and increase the number of participants from 3 to 6 thereby allowing more people to benefit.

CHINCOLD Workshop and Technical Tours

To promote the "World Declaration on Hydropower and Dams for African Sustainable Development" launched at the ICOLD 80th Anniversary in 2008 in Paris, CHINCOLD with the support of ICOLD has since 2009 successfully held nine (9) Workshops and Technical Tours for African delegates to share experience and network together.

A lot of members of the ARC had benefited from this important Program which offers the possibility to learn from the rich experience of the Chinese professionals and have a first-hand appreciation of some of the Chinese projects and achievements in Water resources and the Hydropower sector as well as the organization and management of these resources. The workshop also allows the friendly interaction between professionals from Africa and their Chinese peers.

As at the end of 2016, there had been 74 participants of which 70 were from 27 ARC member countries. The table below gives the frequency of attendance.

Table 3: Attendance to CHINCOLD Workshops and Study Tours

Attendance at the CHINCOLD Annual Workshop and Study Tour			
Countries Represented	No. of Participants	Countries Represented	No. of Participants
Angola	8	Morocco	3
Benin	1	Mozambique	6
Burkina faso	4	Namibia	1
Cameroon	3	Nigeria	7
Congo	1	Pakistan	1
Egypt	3	Philippines	1
Ethiopia	4	Rep. of Macedonia	1
Ghana	3	Senegal	1
Guinea	1	South Africa	5
Guinea Bissau	1	Sri Lanka	2
Ivory Coast	1	Sudan	3
Kenya	2	Tanzania	1
Libya	1	Togo	2
Mauritania	1	Uganda	1
Mauritius	1	Zimbabwe	3
		Zambia	1
Total			74

Bilateral Cooperation

Bilateral cooperation is also an important activity under progress within ICOLD. Several ICOLD national committees have signed Memorandum of Understanding (MOUs) to develop specific activities for the progress and exchange of knowledge on some specific topics or issues. An example is the CHINCOLD initiative with SPANCOLD for the organization of the RCC dam symposium which offers an update every two years of the advances in RCC dam technology. It provides a forum where professionals of these two countries and others could share their recent innovations, work and knowledge and build network for development purposes.

Similarly, the Brazilian Committee on Large Dams (CBDB) and CHINCOLD organize a symposium every two years for the promotion of CFRD and also between USSD and ETHCOLD for the training and support for the organization of Dam Safety Management in Ethiopia.

Bilateral cooperation within ICOLD is to be encouraged between new ICOLD member countries and experienced ones to help consolidate these new committees and enhance the development of the engineering capacity for their individual members and for the committee as a whole.

Participation of Young Engineers

A few decades ago, ICOLD noticed a decline in the participation of young members and set up the Young Engineers Forum to encourage the participation of the young engineers. This initiative was supported by many national committees. The future, the image and the sustainability of the profession has since been elevated over the past decade due to the many initiatives of ICOLD and its committees. It had provided a strong bridge between the generations of professionals whilst creating the right environment to attract more young professionals. The Young Engineers' activities began in Vietnam in 2010, and since then has developed rapidly resulting in increasing attendance of the Young Engineers. A new award for young engineers that show Innovation in Dam Engineering also provides an incentive to attract more young and brilliant professionals to the profession worldwide. With the emergence of new materials, improved techniques and methodologies, advances in IT and Artificial Intelligence, the new era of dam development promises to provide a unique and challenging experience for our young engineers.

The forum encourages young engineers to network professionally with more experienced engineers, thereby allowing them full participation in the global market for dam professionals.

Regional Africa Conferences organized in partnership with Aqua Media International (Hydropower and Dams Journal)

In line with initiatives to support the development of dams and hydropower in Africa since the launch of the Africa declaration in 2008, ICOLD and Aqua Media International in a joint effort and with the support of the Africa Union and other key international associations started organizing Regional Conferences on Hydropower for the development of Africa. The first Conference "Africa 2013" was held in Addis Ababa and was very successful with around six hundred professionals attending. The conference focused on addressing specific topics and issues related to hydropower in Africa including a special session on Capacity Building. Due to the Ebola crisis in Africa, the second conference was postponed to March 2017. The "Africa 2017" conference is scheduled for March 2017 in the city of Marrakech, kingdom of Morocco. During the Africa 2013" conference a final declaration in favor of speeding the development in Africa was issued and signed by key players in the field including international institutions and professional associations, the Africa Union and high level professionals. These conferences offer the opportunity for African professionals to attend workshops and technical courses in Dam safety management, small hydropower design and similar. Participation of young engineers is supported by sponsorship from the Hydropower Foundations of Aqua Media International.

Specific Courses for Capacity Building in Dam Engineering

One of the success stories is that of the courses developed by SPANCOLD in the field of Dam Safety Management. This initiative which started on 2007 is an online web course considered to be very successful judging by the attendance to date. These web-based are in Spanish and feedback shows that it has been very helpful to Spanish engineers and professionals from many countries in Latin America. The course is available now in English. It is considered a model to which other similar courses could be developed in the future for capacity building in the developing and less developed countries with an important component dealing with Dam construction.

ACTION PLAN

FUTURE ROLE OF ICOLD IN CAPACITY BUILDING

ICOLD shall develop a capacity building action plan that would promote skills development of its members, encourage improvements and innovations in dams and shall act as an accelerator for quality improvement and sustainability.

Components of the action plan shall include:

- Development of ICOLD guidelines;
- Development policies and programmes for Capacity Building;
- Funding and implementation of capacity building programmes;
- Promotion and encouragement of the integration of sustainable engineering principles and practices into Dam Development whilst encouraging the consideration of the local cultural, ethical, political, social and environmental components;
- Promotion and encouragement of basic and applied research and development;
- Promotion of programmes to harness interest and educate students and young people in dam development and practice;
- Seek opportunities for multi-disciplinary partnerships and co-sponsorships with diverse professional organizations worldwide
- Create a network for information and experience sharing
- Carry out monitoring and evaluation of the action plan to see its effects and sustainability;

ASSISTANCE AND SUPPORT TO NEW ICOLD NATIONAL COMMITTEES

With the fast growth of ICOLD membership it is necessary to prepare and implement assistance and support for the development and the strengthening of the national committees which are the core of ICOLD as an organization. For this purpose, several activities are proposed:

Cooperation between Established Committees and Younger one

To provide support for the progress of new national committees, ICOLD promotes exchange of experience through joint activities between national committees like the case of SPANCOLD and CHINCOLD or the cooperation between USSD and ETHCOLD.

Cooperation within ICOLD Regional Clubs

Cooperation between ICOLD National Committee Members at the regional level is helpful in the construction and strengthening of new committees. At the regional club, exchange of experience and solidarity can be developed more

easily. Encouraging bilateral and at times multilateral activities involving professionals from the region, is one of the ways to support the progress of new committees. The following activities can be planned and implemented with new committees:

- Cooperation at regional and interregional level
- Participation of multi-disciplinary partnerships and co-sponsorships with diverse professional organizations worldwide
- Creation of a network for information and experience sharing
- Organization of more regional meetings and activities in developing countries

Encourage the Participation of New National Committee Experts in the Technical Committees

ICOLD technical committees are important instruments for capacity building. Therefore, individual members from New National committees should be encouraged to participate in these committees thereby allowing them to meet and interact with established experts as well as allow them to contribute. The new workshops organized by these Technical committees are also important opportunities for capacity building.

Encourage and Ease the Participation of New National Committees in ICOLD Central Activities

Due to the cost of the attendance of ICOLD central activities there is a real difficulty for engineers and professionals from less developed countries to attend these important activities. The CBC has been working with some regional and international partners, with the objective of developing support to ensure that more professionals from less developed member country committees attend ICOLD meetings/congress. This should be pursued further as it will help to strengthen the existing and new committees and improve also the level of the profession in these countries.

SUPPORT TO THE DEVELOPMENT OF CAPACITY IN LESS DEVELOPED COUNTRIES

Preparation and Development of Dam Safety Regulation Framework and Generic Guidelines

Based on the ongoing activities in the organization of Dam safety management framework and regulation in the Nile Basin and on the growing interest and request from developing and less developed countries and some institutions like the World Bank, the ICOLD committee on Dam safety has undertaken the preparation of two documents "Dam Safety Regularity Framework" and "Generic Dam Safety Guidelines" to support these countries

which are preparing such activities to improve the safety of dam in their countries and their region. Workshops are planned in Marrakech for the consultation and mobilization of input and as training opportunity for professionals of ICOLD members Countries attending this conference. These documents would also be used by the CBC to assist new members.

Facilitating TA for Improving Dam Safety Programs

Based on some ongoing experience linked new development in dam construction one area for cooperation and knowledge exchange between ICOLD committee and less developed countries is the implementation of dam safety and surveillance programs. There is the need for the preparation of a basic guideline to assist developing and less developed countries to organize and implement Dam Safety Programs through training and support to national committees upon request. Short courses can also be developed by senior experts and made available online or delivered during ICOLD or Regional club activities. In some specific cases the training and support can be provided through cooperation between well-established committees and new ones. The Generic guidelines for Dam safety and the Dam safety regulatory framework under preparation by the Committee on Dam Safety (CODS) could be used for the basis for preparation of the guidelines.

Extension and Promotion of the Ongoing Training Programs

ICOLD, since 2006, has gained significant experience in the preparation and implementation of training programs. One important tool that would be contributing to the capacity building would be to continue and enlarge the 'on the job' training component of the ongoing programs.

Similar programs to those of Morocco and Turkey can also be extended to other countries and could include the exchange of experts.

Considering the decrease of dam construction in developed countries technical tours or fields training can be organize for young engineers of developed countries in less developed countries and Vis versa to create the opportunities for engineers to participate and learn at various levels.

Workshops and technical tours like the Chincold initiative are also key tools for capacity building within ICOLD.

The CBC is also looking at exchange programs amongst National committees.

On the job training

The advantages of "on the job" training include quick learning from "watching and doing" whilst under supervision, exposure to true life scenarios (actual work process) immediate productivity, training of trainers, quick feedback allowing concentration on needs. Consequently, within the framework of ICOLD it

ACTION PLAN ON CAPACITY BUILDING

should be possible to arrange focused training programs for experts at Dams and other related facilities.

At present, some of the ongoing training programs have elements of “on the job” training as a component of the training program.

Exchange of experts

At the regional level expert interaction plays an important role in dissemination of professional knowledge. The most extensive forum and platform for professional interactions and discussions are ICOLD events. Many companies and research institutions also carry out research and development which are presented at ICOLD event. These events allow the transfer of experience between experts on an international as well as regional basis. However, ICOLD encourages the visits of the experts to the regional and country activities of members.

Interaction with Government Agencies and Multilateral Institutions

With the support of the ICOLD board CBC would solicit for support from Government and non-governmental agencies for sponsorship of Capacity Building activities.

Organization of Regional Conferences in Cooperation with Interested Partners

It is proposed that ICOLD continue to organize regional conferences in developing and less developed regions and countries in cooperation with partners like Aqua Media and other interested partners. These conferences help in building capacity.

DISSEMINATION OF KNOWLEDGE

Free distribution of bulletins

Free distribution of ICOLD bulletins has facilitated access by a significant number of the professionals to the materials and will promote ICOLD's role in capacity building. To continue to inform the public on the work of ICOLD it will be necessary to disseminate information in the form of a compilation of final documents on seminars and congresses.

Focus on Capacity Building on the new ICOLD Web site

One of the important elements in dissemination of knowledge would be creation of a special section on the ICOLD website. In this section ICOLD goals and objectives in capacity building in dam construction would be defined. The

information on future events, training interactive programs, videos on technical tours and others should be available in specific section tabs. A particular area of the website should be reserved for young engineers.

PROMOTION OF THE PROFESSION

Improve the image of the professions

Improvement of the image of the profession should be carried out by distribution of promotional materials on the importance of Dams and hydropower in the development of the society. Emphasis should be put on the main objective of ICOLD which is the preservation and innovative clever use of the world water resources. This and other branding ideas could be the basis of improvement of the image of the profession.

Encourage and Promote Young Engineers

Young engineers should be encouraged to actively participate in the national committees by sponsoring them for ICOLD activities. Professional communities on social networks serve as platforms for exchange of views and communication. Forums of young engineers and informal meetings are regularly held at the ICOLD Annual Meetings. In addition, it is necessary at the regional level to arrange exchange of experience of young engineers by participation in local joint activities.

Development of Promotional and Media Materials for Schools and Colleges

One of the major trends in implementation of corporate identity and formation of image of ICOLD is the development of promotional and media materials for schools and colleges. These are promotional materials, which are distributed in schools and colleges. These form the basis of which impression and opinion on ICOLD and the profession are formed. In such promotional materials, it is necessary to present, in an accessible form, information on ICOLD and hydropower facilities. Within this framework of transferring professional knowledge to students of schools and colleges it would be advisable to consider the creation of a dedicated site specific to the design and operation of hydropower plants.

Link with Engineering Schools and other Institutions

Engineering schools with an emphasis on design and development of dams and hydropower facilities have been formed in different countries of the world. Dissemination of their achievements into the international professional community is an important element in the progress of dams and hydropower.

ACTION PLAN ON CAPACITY BUILDING

The CBC would encourage the compilation of the works of these institutions on the ICOLD web site.

The CBC would also promote a new award initiative for innovative research in dams and hydropower. In this framework excellent master and doctoral research should be recognized. This award will help to provide a better ICOLD link with the younger generation and also the relevant institution.

Facilitation of Participation of Young Engineers

The main barrier of participation of young engineers from developing countries in the ICOLD activities, is the lack of proper funding. At present one of the priorities of the ICOLD is the involvement of young engineers in the organization.

For young engineers under 35 years the membership fees for participation in the events are reduced. ICOLD also holds annual forums of young engineers. ICOLD encourages professional communities of young engineers on social networks where scientific problems are discussed, as well as exchange of scientific information and ideas.

Promotion of Programs to Harness Interest and Educate Students

Organization of training programs in dam and Water resources management is an important element in the promotion of the ICOLD's role in capacity building. Programs to transfer professional knowledge can be carried out at the sites of existing and constructed dams. Creation of the training programs should be carried out by specialized committees.

IMPLEMENTATION AND FUNDING OF CAPACITY BUILDING PROGRAMS

The need for capacity building is appreciated by all national committees' members of ICOLD. One pressing need is the mobilization of ICOLD internal resources to raise funds for the implementation of the capacity building programs.

ICOLD national committees and some key partners like DSI, Morocco Ministry of Water and CHINCOLD have made significant effort in supporting the ongoing training programs. The result of their efforts, confirms that ICOLD can mobilize resources from within for the implementation of such training programs. There is a need for the continuation of these programs.

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Furthermore there is the need to develop relationships and cooperation with multilateral institutions such as the World Bank, regional institutions like the African Development Bank (AfDB), Nile Basin Authority, the Niger Basin Authority, Aqua Media International and others so that CBC can tie its training to actual programs and projects and activity being developed by those institutions.

On 2015, ICOLD commenced discussion with the World Bank on how to work together to promote capacity building in Dam planning, safety and surveillance in less developed countries.

As part of its mandate, the CBC with the support and under the authority of the ICOLD board and Central office will undertake consultations with key partners for raising of funds towards the implementation of the Capacity Building plan.

MONITORING AND EVALUATION OF THE ACTION PLAN;

The Table below highlights details of the monitoring process for the Action Plan which should be carried out in semiannual intervals. The Capacity Building committee shall appoint from its members a Monitoring and Evaluation Officer who will keep the committee informed on the progress of implementation of the various activities by providing semi-annual reports. This reporting will flag issues where the progress is likely to be adversely affected and provide options to accommodate such issues. The Monitoring & Evaluation Officer will also provide regular updates on the Action Plan performance indicators.

Timeframe	Milestone	Results/Indicator
S1	Development of Guidelines	Production of Guideline
S1	Membership Drive	Increased number of members
S1	Support to New Members	Increased participation on committees
S2	Extension of Existing Training Programs	Increased capacity of LD countries
S2	Development of New and Specific Training Programs	Number of participants
S3	Discussion with Multilateral Institutions	Sponsorship of Members
S4	Development Capacity Building Web Page	ICOLD Website
S5	Preparation of Promotional Materials	Printing of School Packs
S6	Solicit for Funding	Sponsorship of Members
S6	Final Report	Independent Assessment of the Action Plan

S = semi annual

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