As founder President of IACRR it is a great pleasure in welcoming you all for this world Launching of International Association for Coastal Reservoir Research (IACRR). On this occasion, we are also launching the International Association for Coastal Reservoir (IACRR) Newsletter – “IACRR Connect”.

The development and the civilization of human race emerged with the availability of water in abundance. Even now, there is enough rainfall on our lands which is simply lost to the sea in heavy rainy days. Due to climate change, rainfall events are becoming intense and sporadic. Some areas receive heavy rain and some areas are drought prone. I would like to stress on the concept of “store rainfall water and save future”, which will lead to new beginnings in water management. We would like to popularise the concept of coastal reservoir in the world through IACRR and quench the thirst of the people across continents.

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I have the fortune of being in the position of first president of this new society IACRR. Coastal Reservoir (CR) application is a paradigm shift in the history of water resources development, from inland dams to storing freshwater in the estuary/sea. This is a new chapter in human revolution; to change our perceptions on the adversity of large volumes of water joining the ocean during the floods into valuable water resources for the benefits of mankind.

In the next 10 to 20 years, as a Society we would like to solve water resources issues for the major cities worldwide. IACRR would be the world’s...
leading organization dedicated to advancing the art and science of coastal reservoir, by promoting a sustainable development of the world’s water resources, that is being lost to the sea. We need support of all members of IACRR to popularise our IACRR’s vision and mission to all.

With this goal of the society, I want to begin my introductory message by welcoming our colleagues, Prof. Roger Falconer, For Xia Sun, Prof. Hubert Savenije, Prof. Shu Qing Yang and Mr. Lim Sin Poh, Dr. Shishun Zhang and all the members of the management committee. The team is one of the most enthusiastic and hardworking volunteers, and certainly a driving force dedicated to the growth, long-term success, and longevity of our Society.

We will be there for each other! Working as a team to get things accomplished and make IACRR a great storage of water in Coastal reservoir is very important to meet the needs of the people all over the world. Countries can live without industrial development but not without water.

Although I may have my own pet projects and personal ideas of what I thought worth pursuing, these had to be weighed against what the members really wanted and needed as well as how best to fulfil these needs. The majority should speak, we will listen and we will work together as a team to get things done. Certain initiatives had to be prioritized and some deferred to a later time in order to address the immediate concerns and issues. A position of Society leader comes with certain responsibilities and insights to be gained. The first is to be sensitive to what our members want and dwell less on what leadership thinks they need. This means we will be actively reaching out to the members and eliciting feedback. I would like to give a new direction to actively pursue, the mission of our Society that is, “Initiation of coastal reservoirs, which leads the profession in setting standards and guidelines to ensure that coastal reservoirs are built and operated safely, efficiently, economically, and are an environmentally sustainable and socially acceptable way”. This continues to strengthen the per capita water storage of every country by adapting to the next generation coastal reservoirs. This vision has been shared and eagerly embraced by the vast majority of IACRR Society members. I am gratified by their support. Thank you all. Welcome to our Newsletter IACRR Connect and Happy reading.

Let us never forget that the IACRR Society is you — our members worldwide. One of the key lessons we are going to propagate through the society is that storage of water in Coastal reservoir is very important to meet the needs of the people all over the world. Countries can live without industrial development but not without water.

society. I also would like to thank Dr. B R Shetty, who has accepted to be our chief patron. I also would like to place on record my sincere thanks to Dr. Prahlada Ramarao, who is guest of honour on this occasion. In addition, I would like to thank my friends, Mr. Kushal Shetty and Dr. Partha Sarathy for all their support in fulfilling our dream of working on water. I would like to place on record the enthusiasm of Dr. Sreevalsa K and Dr. Sivasena Reddy of AMRITA University throughout this endeavour.

Let us never forget that the IACRR Society is you — our members worldwide. One of the key lessons we are going to propagate through the society is that
IACRR is committed to providing the world with sufficient high quality and affordable freshwater. We believe that the world is not running out of water, but water is running out of the world. The global water crisis is not caused by water shortage, but storage shortage; caused by the wrong assumption that people can only construct dams in mountainous areas, not in the sea. Coastal reservoirs are freshwater reservoirs whose dam is situated in seawater environment. We are going to develop floodwater from the sea without desalination. This is the first issue to report the IACRR news in the world.

August is a golden season for harvest. On Aug. 16, we officially announce the birth of IACR, this new born baby may change the world’s water supply strategy; consequently the places where people live and work as water drives everything. Maybe this event is historical, if so, this is the biggest news in issue No. 1.

This is a long pregnant journey originated from 1930s, when USA engineers were constructing their highest Hoover dam across the Colorado River gorge and Dutch politicians and engineers jointly started to construct the longest (32km) IJsselmeer dam in seawater to develop the freshwater from the Rhine River. At almost the same time, a group of dreamers in Australia made their attempts to enclose the outlets of Murray-Darling River, the largest rivers in Australia. They wanted to change the brackish Alexandrina Lake into a freshwater lake. Today, it is time for us to say “thank you” to these pioneers for their trials, their experience and knowledge that directly inspire us and form a solid foundation for IACRR’s further development.

After 1930s, many coastal reservoirs have been constructed and tested in the world, like Hong Kong, Singapore, Korea, China etc., for clean water supply; no matter successful or failed, these practices form the useful lessons for today’s IACRR members. On behalf of them, I say “THANK YOU” to all of these who contributed to these CRs. When they started to build these coastal reservoirs, probably these pioneers already realized that the water shortage in their region is caused by storage shortage, and the sea is a solution for their water nightmare.

Shanghai provides a vivid example for two contradictory conclusions. In 1996, a conference organised by the UN Center for Human Settlements (UN-Habitat) predicted that Shanghai would be one of the dozen cities with the most severe water crisis worldwide, induced by its notorious pollution. Thanks to Shanghai government and IACRR, Shanghai members’ great efforts, now the Qingcaosha coastal reservoir in the Yangtze estuary becomes the world’s largest coastal reservoir and provides 70-80% of water used in Shanghai. In terms of city size, wave/tidal height and torrent river flows, and soil/foundation conditions etc., the Qingcaosha CR may be the most challenging one in the world. Our Shanghai members have successfully solved all technique problems, and the Qingcaosha coastal reservoir has provided good quality water to Shanghai from 2011 for this mega-city with 24 million people (see Fig. 1). When compared, the Shanghai CR with the CRs in 1930s, you can see that so much tremendous progress has been made. For example, Shanghai CR has the capability to select...
good quality water for storage, but old generation one cannot do so; geotubes have been used for its dike construction to replace huge and costly concrete dam or log barrage, etc. Even so, we must admit that we are standing on the shoulders of previous great CR designers and managers. Their knowledge, experience and spirit are inherited by today’s IACRR.

We must also humbly admit that, like every technology, CR technologies need improvement step by step. None of existing coastal reservoirs is perfect; this is why we establish the association for designers, contractors and decision-makers to share their knowledge and experience and to disseminate new technologies quickly among the members. We expect that technologies in coastal reservoirs will be improved/upgraded rapidly and widely.

I am very happy to report my observations for some new technologies that may have high potential to be used in CR construction:

1. Soft marine clay may be consolidated quickly using shock waves induced by bombs. Prof. Sitharam is leading a group of researchers at Indian Institute of Science for such research. The foundation of CR’s dike, or hydraulic structures like pumping house or sluice/tidal gates could be strengthened using this technology.

2. FRP-Confined Concrete for coastal reservoir’s dike construction. Dr Tao Yu and Dr. Shishun Zhang’s group at the Univ. of Wollongong, Australia is conducting research to replace traditional steel-reinforced concrete with Fibre Reinforced Polymers (FRPs) for seawater corrosion resistant skin, hybrid use of sweater and sea sand to produce concrete (where steel is not being used for reinforcement), their preliminary results indicate that similar strength to traditional methods can be achieved, but at lower costs.

3. Agricultural wetland pre-treatment to enhance water quality in coastal reservoirs by removing its nutrients. Prof. Jianjian Lu from East China Normal University, Shanghai, China is leading a group to find an effective wetland to purify river water for storage. IACRR commits to provide the world high quality water using green technology like wetland treatment. It is expected that, at least, quality of water coastal reservoirs is comparable with that in the existing dams, if not better.

On the eve of IACRR’s birth, we must say “thank you” to all founding members, committee chairs and chapter chairs. With your support, today we just need to wait for its birthday, we know that you have prepared everything from its first breed to the cosy environment. We believe you would initiate some coastal reservoirs in your country, or help others to get water from coastal reservoirs in the near future. With all of your great and selfless efforts, our world will be more peaceful and our people are more prosperous. All founding members are encouraged to invite at least 3 new members, and the committee chairs are also required to enlarge his team, at least 20 members in each committee. If so, IACRR should have more than 1000 members in the near future.

It is also good time to say “Thank you” to Univ. of Wollongong for establishing its Centre for Coastal...
Reservoir Research (CCRR) and supporting the registration of International Association for Coastal Reservoir Research in NSW, Australia. We thank all founding institutions:

1. Univ. of Wollongong
2. Indian Institute of Science
3. Amrita University
4. National Institute of Technology Karnataka, India
5. Sarathy Geotech & Engineering Services PVT LTD, India
6. G&P Water and Maritime Pte Ltd, Malaysia;
7. Dayananda Sagar College of Engineering, India
8. Sichuan University, China
9. Wuhan Univ, China
10. East China Normal University, China
11. Shanghai investigation design & research institute, China
12. Cardiff University, UK
13. CCCC FIRST HARBOR CONSULTANTS CO., LTD, China
14. China institute of Water Resources and Hydropower Research, Beijing,100038, China.
15. More to come

Finally I would like to summarize the recent achievements done by IACRR members:

1. IACRR’s website is ready for browsing and individual/group membership payment at http://iacrr.org, facebook https://www.facebook.com/IACRR/.

2. On June 6, University of Wollongong launched CCRR’s inauguration and its meeting minutes is shown below.

3. Special session of Coastal Reservoirs in the 37th IAHR world congress has attracted 14 excellent papers and 42 authors contributed to these papers. The special session of Coastal Reservoir in the 7th IWA-ASPIRE 2017 Conference has attracted 7 papers and more than 20 authors involved in.

4. India has organized two coastal reservoir workshops, the first one on June 16, 2017 can be found from youtube: https://www.youtube.com/watch?v=rdXVEWnuKXY. The second one on July 19, 2017 can be found from youtube or http://www.mangalorecbwssb.com/436013286, and the summary of this workshop is attached below. It is worthwhile to report that currently IACRR India chapter has already 100 members.

5. Bangalore is an inland city in India at elevation of 920m above sea level and 360km away from the coastline. Its water supply and sewerage board, BWSSB funded the research for Netravati coastal reservoir, and the interim feasibility study report has been submitted to BWSSB in July and the research shows that CR can provide sufficient water to meet the demand, its quality fully meets WHO’s standard with minimum treatment. If solar energy is used for pumping, the return period is about 7 years. The existing oil pipelines from Mangalore to Bangalore demonstrate the feasibility of water pipeline.

6. Another city in India, Kollam just offered the CR contract to Indian members for its feasibility study. According to the Indian chapter, India will build many coastal reservoirs and these coastal reservoirs will be linked by pipes to form a necklace or “SAROVAR MALA”. If so, the US$168 billion Indian Rivers inter-link project could be replaced by the necklace. India’s grand plan to create the world’s longest river has been under debate for half century.

7. Malaysian members conducted aerial survey for Langkawi coastal reservoir. Government’s original plan for this island’s water supply is to import water from Malaysian peninsula or desalination, after IACRR members’ promotion. Now, the government has shifted to “downstream storage” or coastal reservoir strategy.

8. Malaysian members also conducted aerial survey for Pulai SG coastal reservoir.

All in all, to quench the global thirst using floodwater lost to the sea is a long journey. ‘The journey of a thousand miles begins with a single step’, IACRR members need to stand up to sell our ideas to top politicians and researchers one by one, use every opportunity to promote CR in media to educate the public about the truth- we have enough water, our crisis is storage shortage- coastal reservoir is the solution.
The world faces considerable water management challenges now and increasingly more in the future; primarily brought about by: the anticipated impacts of climate change, the increasing need to provide more water, food and energy for a growing global population, and increasing globalisation - leading to a wider global wealth distribution and a corresponding increase in demand for water, associated with the need for more commodities (such as cars), clothing etc. In addition, in most countries worldwide, there is an increasing population shift away from rural communities to larger cities and better employment prospects, with these cities generally being located along the coast. However, coastal cities are frequently vulnerable to limited access to adequate water resources, poor water sanitation, coastal, estuarine and river flooding, sea level rise, increased energy demands etc. It is therefore timely that we look to the future to address some of these challenges in a sustainable manner and working with nature to develop coastal reservoirs to contribute to the solution of some of these challenges.

Coastal reservoirs provide a logical and cost effective solution to storing freshwater towards the end of the river basin, enabling the freshwater to be treated and distributed around the city at a much lower cost than the alternative of building high head reservoirs, upstream along the river basin, and then having to pump the treated water to the city for distribution. The water level can also be controlled in coastal reservoirs, thereby offering opportunities also to reduce flood risk from the sea locally and abstract more water during river floods, thereby reducing the local water elevation and the upstream backwater effects, and thereby reducing the flood risk.
Coastal reservoirs can also be developed to provide other opportunities, such as urban regeneration and potentially renewable tidal energy. An excellent example of a coastal reservoir built for urban regeneration is the one that was provided through the Cardiff Bay Barrage project, opened in 1999, to reconnect Wales’ capital city of Cardiff with its waterfront. In the period between 1850-1920, the Port of Cardiff grew considerably, with significant investment and expansion, leading to the port reaching its full potential by about 1920, and with the port then being ranked as one of the largest in the world, shipping coal and iron-ore globally (http://www.cardiffbay.co.uk/history/). From the 1920s onwards, the port went into decline; and there was a major loss of trade to other ports world-wide as the ships became larger; and with the increasing challenges associated with the Bristol Channel and Severn Estuary having the second largest tidal range in the world. In 1987, the Cardiff Bay Barrage Act was passed by the UK Parliament and a 2.4 km long tidal exclusion barrage was constructed across the mouth of Cardiff Bay, impounding two rivers, namely the Taff and Ely, regenerating an area of over 1000 hectares and creating a large freshwater lake, connecting the city of Cardiff back to its waterfront. Water management of the new freshwater lake, as compared to the previous highly intertidal basin, has required challenging solutions to meet the legal requirement of maintaining dissolved oxygen levels within the reservoir at above 5 mg/l. In addressing this legal and challenging requirement, nearly 400 aeration systems are distributed across the Bay, avoiding stratification and deoxygenation and particularly during the summer months. The Cardiff Bay coastal reservoir project has been a considerable success story in regenerating Cardiff as a major city, across Europe and beyond; further highlighting the opportunities that the coastal reservoirs can bring to cities, their communities and the quality of life of those residents in the city and urban region (https://en.wikipedia.org/wiki/Cardiff_Bay).

Message from the Vice President

Prof. Jun Xia
Vice President IACRR
Vice-president, Academician of Chinese Science Academy;
Former president of the International Water Resources Association (IWRA)

This is a historical moment in human’s evolution, and from this moment our attitude towards flood has been changed. Like everyone on the planet, I treated floods as my worst enemy and wanted to eliminate it all; and this is partly because of my horrible flood experience. In 1975, a severe flood struck my hometown, which caused the death of more than 26,000 people and great property losses. I was one of the lucky survivors, but deeply touched by this catastrophe. From that date, I decided to choose hydrology and water resources as my lifelong career in order to control flood disasters. I have buried myself in developing effective methods to predict water disasters, flood control, operation and management. I observed many effective ways like inland dams, dike enforcement, better management, and flood risk map, etc. Thanks to all these works, now people’s welfare and safety have improved. But the consequence is another disaster-water shortage as floodwater is quickly discharged into the sea.

Now my attitude towards floods has changed. It is my worst enemy only when it exists on the continent, and it is also my best friend when it goes to the sea. I can summarize that our current water scientific communities have limited their research within continent region, with little attention to freshwater resources in the sea. My 30 years working experience also tells me that Human never has the capability to control flood in 100% cases, and we must co-exist with floodwater in harmony and treat floodwater as our friend somehow and somewhere.

IACRR offers the world the new water solution- to “store and utilize floodwater” in the sea. I can also see that there are unlimited R&D opportunities for IACRR members. This is a new chapter, congratulations to all members. You have chosen a right direction to go! I will accompany you all the way like my last journey from 1975. Sooner and later, everyone will change their attitude to floods like you and me.

I also want to encourage all water planners, politicians and managers in the world to contact IACRR, once you are unsatisfied with your water solutions suggested by other group of experts. We will work with you to find a better water solution for your city, which is cost-effective, environment-friendly, socially acceptable and sustainable with low carbon emission.
In the 1960s and 1970s, Professor Adriaan Volker, holder of the International Hydrology Prize (1984) of the International Association of Hydrological Sciences (IAHS) and the person after which the IAHS Volker medal has been named (http://iahs.info/About-IAHS/Competition--Events/International-Hydrology-Prize/International-Hydrology-Prize-Winners/A-Volker.do) was a pioneer on the design, the hydrology and hydraulics of coastal reservoirs. He was the scientific genius behind the design of many coastal reservoirs and land reclamation works within such reservoirs. Examples are: The Dutch Yssel lake polders in the heart of The Netherlands, but also Kojima Bay and Isahaya Bay in Japan, Marateca Bay in Portugal, and Kuttanad bay in Kerala, India. His most important contribution was to consider both the water balance and the salt balance to assess the feasibility of closures and the empoldering of coastal reservoirs. In the past, many mistakes had been made, particularly regarding the salt balance, whereby expensive reclamation projects became failures. Particularly in hot climates, the salt balance is often a crucial element of coastal reservoir feasibility, but also in temperate climates, as was demonstrated by the failure of the Braakman coastal reservoir in The Netherlands. An aspect until then overlooked, was the saline seepage towards the empoldered area from old marine deposits and saline groundwater.

Since then, the experience in design and construction of coastal reservoirs has grown considerably, but more importantly, the motivation for the construction of such reservoirs has changed, as societal demands changed over time. In the past, the main consideration for empoldering was to create additional agricultural land. At present, the dominant considerations for coastal reservoir construction or for the modification of existing works are to deal with sea level rise, the availability of fresh water in densely populated coastal regions, salt water retention, environmental quality, and sustainable energy. In recent times, reclaimed coastal agricultural land is rapidly being transformed into urban settlements, airports, industrial areas and seaports.
response to growing environmental awareness and fishery demands.

Also, the purpose of the reclaimed land changed considerably. In response to environmental opposition, the last polder that was planned in the Yssel lake was never completed, and is presently converted into an environmental reserve that should restore biodiversity and attract migratory birds. A large part of the largest polder (Flevoland) is now a national park with free roaming wildlife, where it was originally designed as an industrial complex. The Yssel Lake polders and water are also host to numerous wind turbines, and there is talk of building a new international airport in one of them.

So, we can see that coastal reservoirs and their polders serve multiple purposes that change over time, as the societal demands and priorities change. With the ever-growing pressure on coastal regions, and the intensified use of coastal land and water resources, integrated and sustainable management of coastal reservoirs and polders is only going to become more important. Therefore, the establishment of the IACRR is not only timely, it is extremely important to further research and engineering practice into the design, re-design, management and operation of such complex systems.

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**Message from the Chief Patron**

Good morning professors and scientists on and off the dais, dignitaries, ladies and gentlemen gathered here.

Prof. Sitharam made an interesting statement during one of my recent interaction with him – “world is not running out of water!! BUT WATER IS RUNNING OUT OF THE WORLD” what an alarming and thought-provoking statement.

The five basic elements of nature as mentioned in our ancient books, water, earth, fire, air and sky are in perfect balance with our body. About 71% of the earth is covered by water, but 96.5% of this is in oceans, salty and not potable. Only 3.5% is fresh water which is in the form of ice caps, rivers, lakes and in the form of vapours and moisture in the air and soil. According to some studies made available in public domain, less than 1% potable water is available and fit for human consumption. As per UNO census of April 2017, the entire population of the world stands at about 7.5 billion, which has to live with less than 1% potable water. Isn’t it quite alarming? What about the future need of ever growing population and where and how can we improve the source or supply of pure drinking water.

Water is an all important element of organisms, some of them contain 90% of their body weight, where as an adult human body contains up to 60% of body weight. All-important brain and heart contains 73% water and lungs contain about 83% water. These facts and figures published by the scientists are the clear indications of the importance of water in our life too. So, water is an all important element of our life. We need to question ourselves what have we done to preserve this all important element for us as well as our future generation. If not now, then when? Modern Social THINK TANK says that if at all third world war takes place, it is for water and nothing else. Water will become a scarce commodity within no time.

Our age-old solution – reduce, re-use and re-cycle may not hold good in this situation. Then What?

To my understanding there is no shortfall of water supply by nature. Statistics says that average rainfall has not decreased across the world, but pattern might have changed. Instead of a long monsoon season, there could be short and intense rain fall, but the quantum of rainfall is more or less the same.

Let us take the situation of Mangalore, my native place. There are 13 west flowing rivers in Karnataka,
originating from the western Ghats and joining the Arabian sea, a maximum distance of about 100+ kilometres. As per the national statistics, these 13 rivers dump about 2400 TMC of flood water to the sea every year. Still, our dear state is facing acute drinking water shortage in the summer months. Because this happens in a short monsoon period ranging from 3-4 months in a year. As per the UN standards of 150 liters/day/person, entire population of about 60 million of Karnataka state requires only 90 TMC of drinking water. Unfortunately, we are reeling under severe drinking water shortage in the summer months. The surprising fact is that Netravati river in Mangalore alone dumps about 400 TMC of water every year to the Arabian Sea which is almost 4 times more than our annual requirement.

I presume that the situation in most of the other countries is nothing less than what it is in India.

So, with these facts and figures one can come to the conclusion that there is no water shortage. If at all there is any shortage, it is the shortage of water management which can be addressed by out of the box ideas, rational thinking and innovative solutions.

I am given to understand that Prof. Sitharam and his team has suggested a brilliant idea of building sea based coastal reservoir to impound flood water during monsoon season and supply to Mangalore and Bangalore cities in the summer months.

I would like to congratulate you Prof. Sitharam and your team. What an excellent proposition which can solve the drinking water problem for centuries, without destroying the environment and marine life. I am sure this innovative concept can be implemented in all the states of India to put an end to drinking water shortage in all coastal cities of India. Besides, it can also resolve inter-state water disputes which has become a serious threat to the federal structure of India. I hope our political leaders and officials will take positive note on this project and implement at the earliest. I assure my support and offer my services wherever required in this noble cause of drinking water.
I also would like to thank the office bearers of IACRR (International Association of Coastal Reservoir Research) for inviting me to be amongst you at this world congress, where in I got the opportunity to get updated and enlightened about water crisis across the globe. But the good news is that water crisis is not all that bleak, there is a sustainable solution hatched out of your brains, scientists and hydrogeologists gathered here and I am more than happy to associate with you all to incubate the same and bring to this world.

I am humbled by your offer to be the Chief Patron of IACRR which I happily accept and please accept my heartfelt gratitude for giving me an opportunity to associate with you to provide sustainable solution to drinking water problem across the globe.

Once again, congratulations to the entire team of IACRR who have put up a grand show here and I wish our, I emphasize ‘Our organization’, to be the leader in guiding the BLUE REVOLUTION to quench the thirsty human kind. Thank you one and all.

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**Message from the Guest of Honour**

Water is lifeline for every individual, society, small towns and big cities. Potable clean water has become a precious commodity, especially in urban areas. The source of water supply is dwindling while the per capita consumption is increasing.

Already every river has been dammed adequately and except for maximum of 2 months in the monsoon, the rivers are dry and the dams are not able to meet the water requirements adequately, even during a normal monsoon year.

Fortunately, coastal fresh water reservoir concept, is a proven solution and associated technologies have been adequately addressed and implemented in a number of countries successfully and are in use. The concept works on the fact that the quantity of precipitation in a year has remained constant, though the pattern of rainfall has changed drastically in all countries. Most of the rain water runs off into the seas and gets mixed with the saline water. Building more dams on land just to gather monsoon water has become impractical, expensive and environmentally unacceptable. Civil engineers have moved to the mouth of the river entering into the Ocean and brought out designs of keeping fresh water isolated from sea water. This results in coastal fresh water reservoir, without the attached complications of vacating hundreds of villages and acquiring thousands of acres of land for constructing land based reservoirs.

Pumping of the stored water over 100s of Kilometres to supply the cities is a much understood proposition with adequate experience in the country.

As an icing on the cake, the world has experienced unprecedented and unexpected developments, innovations and growth whenever such game changing concepts take shape. The entire Coastal reservoir has full potential to transform itself into a modern township, Energy Center (Solar and wind), health centre, water sports and entertainment hub, new source for fresh water pisciculture and aqua- culture. It will grow into a new tourist centre, humming with economic activities.

My greetings and Best Wishes for this Initiative by Prof. TG Sitharam and his collaborative partners from Australia, Malaysia, Amrita University, NIT Surathkal and CIFT. The project being taken up across Nethravati can be replicated at many locations and expanded into an activity of National Importance. This will change the history and Geography of the Country, India.
Message from the Chairman (India)

I am very glad to be at the Launching ceremony of the International Association for Coastal Reservoir Research (IACRR). I am also very happy to see large galaxy of experts coming from different parts of the continents, who are interested to promote coastal reservoir concept. In the team, I noticed past presidents of IAHR, IAHS and IWRA. I know Prof. T G Sitharam from Indian Institute of Science, Bengaluru who has an innovative idea of impoundment of river flood water that run off into sea in a sea based reservoir. Impounding of river flood water using sea based reservoirs and pumping the same to the required area is the only permanent solution for water shortage in the future. He has developed the scheme for storing river flood waters in the ocean across Indian subcontinent like a necklace called as Sarovar Mala. This is an innovative idea which is implementable to handle India’s water shortages, using next generation reservoirs in the ocean. Successful management of water resources is the key and we would like that all the members of IACRR should contribute to many developing and developed countries, by providing the necessary technology, skills and resources from IACRR side for the planning, design and construction of coastal reservoirs. We would like to popularize the activities of IACRR through the India Chapter. I am happy to lead the India Chapter of IACRR. We assure you that our total commitment to make this society a great achievement for all of us, of course with all the experts with their scientific temper and commitment. I feel very proud that this society would enhance water availability to all in the world. The launching of this society has evinced a good response from the researchers and practitioners who carry out research and development in the coveted areas of water, water resources and coastal reservoirs. The hallmark of launching event is best brought out by the perfect planning and meticulous execution by the team lead, Prof. Sitharam. I congratulate the entire team.
# INTERNATIONAL ASSOCIATION FOR COASTAL RESERVOIR RESEARCH (IACRR)

**Launching of IACRR**  
16 August 2017 (WEDNESDAY), 2 PM to 6 PM  
Venue: Ballroom 3, Seri Pacific Hotel, Jalan Putra 50350, Kaula Lumpur, Malaysia

## PROGRAMME

<table>
<thead>
<tr>
<th>TIME</th>
<th>AGENDA</th>
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<tbody>
<tr>
<td>9:30am – 11:00 am</td>
<td>Coastal Reservoir Special Session 1 at PWTC (IAHR venue)</td>
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<tr>
<td>11:30am – 12:30pm</td>
<td>Coastal Reservoir Special Session 2 at PWTC (IAHR venue)</td>
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<td>12:30pm – 2:00 pm</td>
<td>Lunch Break</td>
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<td>2:00 pm – 2:45 pm</td>
<td>IACRR 1st Board Meeting – Club Lounge, Seri Pacific Hotel, Jalan Putra</td>
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<tr>
<td>2:00 pm – 2:45 pm</td>
<td>Arrival of Guest and Registration - Ballroom 3, Seri Pacific Hotel, Jalan Putra</td>
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<td>2:50 pm – 3:00 pm</td>
<td>Welcome Address by IACRR President Prof. T G Sitharam, Chair Professor, Indian Institute of Science</td>
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<tr>
<td>3:00 pm to 3:10 pm</td>
<td>Speech by IACRR Vice President Prof. Roger Falconer, Past President of the International Association for Hydro-Environmental Engineering and Research (IAHR)</td>
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<td>3:10 pm – 3:20 pm</td>
<td>Opening Remark by Chief Patron Dr. B R Shetty, Chairman and Managing Director, NMC and Chairman of UAE Exchange, Abu Dhabi, UAE</td>
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<td>3:20 pm – 3:25 pm</td>
<td>Speech by Invited Guest of Honour Dr. Prahlada Ramarao, Former Distinguished Scientist &amp; CC R&amp;RD DRDO; Former Vice Chancellor, DIAT(DU), DRDO, Min of Defence, Govt. of India</td>
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<td>3:25 pm – 3:30 pm</td>
<td>Speech by IACRR Vice President Prof. Xia Jun, Past President of International Water Resources Association (IWRA, 2009–2012), past Vice President of the International Association of Hydrological Sciences (IAHS, 2004–2007), Board Governor of World Water Council (WWC, 2009–2015)</td>
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<tr>
<td>3:30 pm to 3:35 pm</td>
<td>Speech by Vice President Prof. Hubert Savenije, Professor of Hydrology at Delft University of Technology, Past-President of the International Association of Hydrological Sciences (IAHS)</td>
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<tr>
<td>3:35 pm – 3:40 pm</td>
<td>Launching of IACRR by IACRR Founders</td>
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<td>3:40 pm – 3:45 pm</td>
<td>IACRR Website and Newsletter release by Chief Patron</td>
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<tr>
<td>3:45 pm to 3:50 pm</td>
<td>Speech by India Chapter’s Chairman – Mr. Kushal Shetty</td>
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<tr>
<td>3:50 pm – 4:15 pm</td>
<td>Tea break &amp; Registration of IACRR membership</td>
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<tr>
<td>4:15 pm – 4:45 pm</td>
<td>Presentation by Co-Founder Associate Prof. Yang Shu Qing :- Introduction to CR and International Experiences</td>
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<tr>
<td>4:45 pm – 5:00 pm</td>
<td>Question and Answer</td>
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<tr>
<td>5.00 pm – 5:15 pm</td>
<td>Award Ceremony</td>
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<tr>
<td>5:15 pm – 5:45 pm</td>
<td>Press Conference - Ballroom 3, Seri Pacific Hotel, Jalan Putra</td>
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Activities of the coastal reservoir

Meeting summary of Center for Coastal Reservoir Research, University of Wollongong, Australia, on June 6, 2017.

In this meeting, the existing solutions in Australia are compared such as water restrictions, rainfall harvesting, inland dams, wastewater recycling and desalination. Brisbane’s “tragic error of judgement” in constructing a $2.5 billion wastewater treatment plant, only to discover that the consumers are not willing to drink wastewater.

In Australia (the “driest continent”), there is around 440 km³ of run-off annually, whereas the annual consumption is around 20 km³.

Existing examples of CRs can be found in the Netherlands as well as some failed Australian attempts at Lakes Alexandria and Albert, as well as Singapore’s Marina Barrage. These are the 1st generation of CRs and some of their shortcomings include: concave barriers, which are short and straight; storing polluted water and disgorging clean water; and blocking sediment.

Fibre Reinforced Polymers (FRPs) are the next generation of construction materials, which can be used a corrosion resistant skin or as stay-in-place formwork for concrete, delivering improved strength and ductility. Hybrid structures incorporating FRPs are also being investigated and include high-strength concrete, high-strength steel and embedded sensors. Hybrid use of sweater and sea sand to produce concrete (where steel is not being used for reinforcement) is a further innovation worth noting: preliminary results indicate similar strength to traditional methods, with reduced costs.

INTERNATIONAL WORKSHOP ON COASTAL RESERVOIRS on July 19, 2017.

This meeting was organized to review the progress of the BWSSB project at AMRITA University campus. They have reviewed the work so far carried out in the project and gave their feedback as well. Dr. Prahlada explained the various developments that can happen in the country after the construction of a coastal reservoir, citing the examples of success stories of Highway and surrounding developments in Malaysia and USA. He insisted on making the topic of Coastal Reservoir a chapter in the NCERT syllabus, so that the children from a small age get to know about this technology. He clued that the signs of feasibility of coastal reservoir were positive and gave the advice to develop new business models for Coastal Freshwater Reservoir.

Mr. Kushal Shetty spoke about the water shortage in Bangalore and Mangalore and the challenges of installing a desalination unit and highlighted the need of coastal reservoir across Netravati river. He described this project as an important one and He inspired the team to move forward in this project quickly. The Dean of Amrita School of Engineering told that this concept of Coastal Reservoir will change the situation of water storage in India. He also mentioned that it can be a solution to the Karnataka- Tamil Nadu water conflict.

Prof. T.G. Sitharam said that the CR technique will help to march towards blue revolution and a sustainable strategy for the water resource development for the state of Karnataka. He presented the concept of Sarovar Mala, an idea of creating a link between river Ganga in the north and the rivers of south India and western India through coastal reservoirs. He highlighted the importance of increasing the storage with a slogan “store water and save future”.

Shu- Qing Yang called the dams and reminded us about the fact that dams are not forever, and that dam capacity decreases with time. He discussed the other solutions for meeting the increasing water demand of the increasing population. He analysed the International experiences of construction of coastal reservoirs in Singapore, China, Australia and Korea. Mr. Lim Sin Poh, stressed on the point that India is not short of water but water is running out of India. He discussed the various operations happening in a coastal reservoir like that of opening the gates of the reservoir when the water quality is less and gave a case study of Shanghai Coastal reservoir.
Dr. Sivasena Reddy highlighted that Coastal reservoir is the best concept to increase the storage and a sustainable solution for the water problem. He stressed that the idea of Coastal Reservoir is the best water conservative alternative. Dr. Sreevalsa Kolathayar conducted the seismic analysis for the Netravati Gurupura basin and he concluded that the basin does not face any seismic threats. He demonstrated the concept through the studies carried out so far as very feasible and elegantly doable project.

A site visit was made to Mangalore on July 18, 2017.
Coastal reservoir (CR) has the potential to store the flood water of the river joining the sea and thus meet the water requirement of the water starved cities. Such a reservoir near the Mangaluru coast would augment the water demands of Bengaluru, India, which is the third largest populated city with acute water stress and it can also augment the agriculture activity in the region of Dakshina Kannada, India. Mangaluru is blessed with river Netravati which carries a large quantity of water during monsoon and finally, ends up in the sea. As the river flows through different terrains and thick dense forest over a length of 103 kms, a large quantity of this flood water can only be stored near the ocean, by building coastal reservoirs. Between 1989 and 2013, the average annual runoff in Netravati basin is estimated to be 388.5 TMC ft. Hence, in principle, a small percentage of runoff of Netravati is more than sufficient to cater to the water requirements of both Mangaluru and Bengaluru. From the data available for the last few decades, there is hardly any indication of scarcity of water in the Netravati River. The concept of coastal reservoir emerges as the best ‘Sustainable solution’ to meet the future water demands of both Bengaluru and Mangaluru.

The Project funded by BWSSB, Govt. of Karnataka envisaged to carry out a feasibility study on developing a sustainable water source for Bengaluru and Mangaluru, using the coastal reservoirs as a storage area for Netravati/ Gurupura river flood waters. The principal objective of the project is to assess the feasibility of storing fresh water in a reservoir along the coast, by building a sea dike in the Arabian sea. On one side, the dike will ensure the required quantity of fresh water flow from the Netravati to the reservoir, without being drained to the sea. On the other side, the sea dike will prevent the seawater from entering the reservoir, avoiding the salt contamination of the fresh water supply. This study addresses the coastal urban watershed management of Mangaluru city and agricultural land along the river and the coast, in the context of the proposed project of building a sea dike for the creation of a fresh water reservoir impounding river flood waters.

The results of the feasibility study state that, there is enough water available at the outlet of Netravati basin for Mangaluru and Bengaluru. The technologies available are elegant to construct the dikes in shallow sea and on the soft sediments, and the geotechnical profiles clearly indicate that one can develop the coastal reservoir in and around the mouth of the Netravati river. In specific to state, the average annual runoff in Netravati is 388.5 TMC ft. As per studies, the shortfall in demand in Bengaluru for 2051 is 26.16 TMC ft which is 7% of the average annual runoff through Netravati. In 2021, the shortfall in demand is only 8 TMC ft which is just 2.1 % of the runoff. Enough water is thus available in the river Netravati to cater to the needs of Mangaluru and Bengaluru.

Water quality parameters in both the rivers, Netravati and Gurupura are well below the tolerable limits and can thus be directly used without any direct treatment. The river water during the floods (which will be stored in the proposed coastal reservoir) will be of much better quality. There is hardly any chance of silting of the reservoir as the average annual sediment load in Netravati River is only 0.04 TMC ft. Even in this sediment load, part of it can be taken as fresh water river sand through dredging in the created fresh water reservoir. From the details of hydrological analyses and annual runoff estimation from water shed modelling, it is evident that there is assured plentiful quantity of water. Since the rainfall is very high (>3000 mm annually), salinity in the
6m into the sea from the coast, a sea dike has been proposed with two inlets and two outlets to operate the reservoir to ensure the continuous flow and movement of water within the reservoir (to avoid stagnancy of water).

The sectors that are benefitted due to coastal reservoir are agriculture, fresh water fishing, prawn culture, sand dredging and new livelihood opportunities for the local people and fishermen. A fishing wharf can be established along the dike of the coastal reservoir which will provide deep water fishing options for the fishermen and thus, paving the way for Mangaluru to become a large exporter of both marine and fresh water fishes. The possible renewable energy generation using solar, wind, tidal and wave energy implies that the system will be self-sufficient in energy to meet the energy demands for pumping water to Bengaluru, lighting and other industrial / domestic requirements. To summarize, the ‘Coastal Reservoir’ at the mouth of Nethravati would actually satisfy the need of water for both Bengaluru and Mangaluru to the projected population of 2051 and also improve the standard of the Mangaluru coast developing the area into a sustainable, clean and green fresh water township.
Article on Experience

A cultural tour in India: what I thought and Saw
by
Assoc. Prof. Shu-Qing Yang
University of Wollongong

Thanks to Prof. Sitharam’s invitation to design the coastal reservoir in Mangalore, I had the opportunity to visit India to learn about their successful experience in coastal reservoir development. In Kuala Lumpur, I met with Mr. Sinpoh Lim, managing director of G&P Water & Maritime in Malaysia. Both of us share many similarities: like many Asian, we came from a Buddhist family and our blood circulates Indian genes like his philosophy which governs our daily life. Of course, both of us are the dreamers of coastal reservoirs and water lovers.

On July 16, 2017, our plane landed at Bengaluru International airport on time at about 10:30am. Totally different from what we imagined, the air is so clean without pollution, the sky is so blue and the airport is huge and new, especially the weather is comfortable. We were told that Bangalore’s nickname is air-con city. Both of us concluded quickly that Bangalore is a well-developed paradise for people to live and work.

In the following days from July 16-23, we visited 4 universities, attended 4 seminars/workshops, and made many new friends. From these interactions, we have our impression that:

1. India was/is/will be a great country all the time, because of its Great leadership, great people and great nature. From the past, Indian civilization deeply influences on cultures in China, Korea, Japan and southeast Asia as well, mainly by Buddha’s teaching. Today, I feel that PM Modi is one of the greatest leaders among current world leaders, this can be simply seen how he deals with corruption using money as a weapon, how he promotes the Gujarat coastal reservoir etc. All people we met are very talented, also very humble, hardworking and quick learners with vision and dream. Probably, Prof. Sitharam can be taken as a vivid example with a combination of great leadership, great team maker with great dreams.

2. A paradise for wild life. In these days, we saw peacocks walking in a campus, bulls and cows on busy street, and fences on both sides of highways to protect wild life. We are told that more than 30% of Indian people are vegetarian. How lucky the animals in India are! Thanks to Indian people, probably future generations in other places need to travel to India to see some animals, because only here people protect animals so good.

3. Coastal reservoir may have quicker development in India relative to other places in the world, due to great leaders, and great people. It is certain that India will lead the world in this area. Indian coastal economic belt will soon start to bloom.

On the way back home, both Mr. Lim and myself said to our new friends that we will return to this robust land soon. We believe once water and transport infrastructures are improved, Bangalore will be the most liveable city in the world and we will try our best for this target with our new friends together.
IACRR Membership

IACRR memberships offered:
Individual Membership: lifetime fellow, lifetime member, ordinary member and student member
Institute/Company Memberships: research institutes, companies, engineering firms, universities and consultants

Kindly log into the following link: http://iacrr.org/join-iacrr for online membership registration.

MEMBERSHIP BENEFITS

Benefits for Individual Memberships:
• Access to proceedings, papers, online committees, directories, and more.
• Discounts on all books, monographs and proceedings published by IACRR.
• Reduced fees for IACRR (co-sponsored) conferences and symposia.

Benefits for Institute/Company Memberships:
• Staff of the institute/company will be entitled to the same benefits as an individual membership

In addition to the aforementioned benefits, membership of IACRR provides networking opportunities with organizations from various sectors within the water industry.

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<th>Category of Membership</th>
<th>Amount Payable</th>
<th>Mode of Payment</th>
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<tr>
<td>Corporate Membership</td>
<td>1000 USD</td>
<td>In one lump sum</td>
</tr>
<tr>
<td>Life Fellow</td>
<td>250 USD</td>
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<tr>
<td>Life Member</td>
<td>150 USD</td>
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<tr>
<td>Ordinary Member</td>
<td>50 USD</td>
<td>Annually, in advance</td>
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<tr>
<td>Student Member</td>
<td>20 USD</td>
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Although, 2/3rd of the earth’s surface is covered by marine and coastal waters, including deep ocean waters, the fresh water is less than 3%. Urbanisation leads to greater utilisation and thus the demand for fresh water is rising rapidly. Water scarcity is increasing day by day and nearly 1.2 billion people are affected around the world. In developing countries like India, economic water scarcity (ie., lack of infrastructure and/or poor management of available resources), leads to water crisis and the same is true in every part of the world. Lack of access to fresh water leads to health hazards and water borne diseases, which is also one of the major concerns affecting healthy lifestyle. The emerging sustainable technology to solve the world’s water problem is to construct coastal reservoirs. A Coastal Reservoir is a freshwater reservoir, located in the sea at the mouth of a river with a sustainable annual river flow (Yang et.al 2013). An impermeable barrier separating fresh water and salt water, makes the coastal reservoir effective. Development of coastal reservoirs, also opens the path for economic development of the region (by way of developing wind farms, artistic water bodies promoting tourism, creating employment etc).

Marine and coastal engineering involves a number of different types of engineering such as Geotechnical engineering, structural engineering, environmental engineering and energy systems engineering etc. Any structure to be placed within the marine environment must be designed to withstand the large forces exerted by currents, waves and offshore winds. Sarathy Geotech & Engineering services Private Ltd., (SGES), is already an established player in providing engineering services for Marine, coastal and offshore projects. Integrated site survey services together with engineering solutions to the design of structures augment for the turnkey capability along with its eco partners.
G&P WATER & MARITIME SDN BHD (GPWM) is part of G&P Professionals Group, a specialist one stop engineering consultancy services centre with a staff strength of over 350 people.

GPWM is a specialist one stop water engineering services company providing wide range of services on water engineering, specializing in study and design pertaining to hydrology, hydraulics, flood mitigation, water resources, water treatment and supply, pipeline, sewerage treatment, drainage, water quality, coastal hydraulic modelling and physical modelling, jetties and port structures, breakwaters and coastal protection structures.

The founder of GPWM, Ir. Lim Sin Poh is a strong promoter of Coastal Reservoir (CR). He is also the Co-founder of IACRR. GPWM signed an MOU with the University of Wollongong in 2015 to promote CR in Malaysia and worldwide. Through continued effort from both parties, today, CR has become the most discussed and preferred water resources option, not only in Malaysia, but also in India and other countries.

In July 2017, together with Associate Professor Shu Qing Yang, Ir. Lim visited Netravati River, working together with the team, led by Prof. Sitharam, and produced the Preliminary Concept Design of Netravati CR.

GPWM is committed and ready to share their knowledge and experiences, working hand in hand with scientists, researchers, contractors, developers and all parties to promote and ensure successful design and implementation of CR worldwide.
Registration Number: INC1700081

Date of Incorporation: 20 January 2017, issued by NSW Fair Trading, Australia under the Associations Incorporation Act 2009.

A paradigm shift from 'discharging floodwater' to 'storing and utilizing floodwater' by the coast.

ABOUT

IACRR was founded in January 2017 in Australia. It is an international nonprofit organization set up to promote and develop Coastal Reservoirs (CR). IACRR welcomes members from various sectors such as engineers, scientists, researchers, industry players, suppliers, contractors, developers, water agencies, operators and decision makers.

CR is a paradigm shift in water resources development from storing water in inland dams to storing freshwater by the coast. This converts floodwater into valuable water resources closer to the demand centres. IACRR will be the platform for sharing of knowledge and experience to ensure successful implementation of CR worldwide.

VISION

Solving water shortage issues in major cities worldwide.

To be the world’s leading organization, dedicated to advancing all aspects of CR and promoting the sustainable development and management of surface water otherwise lost to the sea.

MISSION

Initiation of CR by leading the profession in setting standards and guidelines to ensure that CR is built and operated safely, efficiently, economically, and are environmentally sustainable and socially beneficial.

Assisting coastal cities to meet their water challenges using CR by optimizing its design, successful construction and management, maximizing the output and minimizing the negative impacts on environment and society;

Inspiring coastal cities’ development by integrating its water resources with land resources and manpower resources, hence enhancing the world’s living standard and reduce global poverty.