XVII World Water Congress
International Water Resources Association (IWRA)

www.worldwatercongress.com

Download the XVII World Water Congress App

WWCongress WWCongress worldwatercongress

IWRA | Daegu Metropolitan City | Korea Water Resources Association | K water Korea Water Resources Corporation | Ministry of Environment

XVII World Water Congress
International Water Resources Association (IWRA)

Hosted by

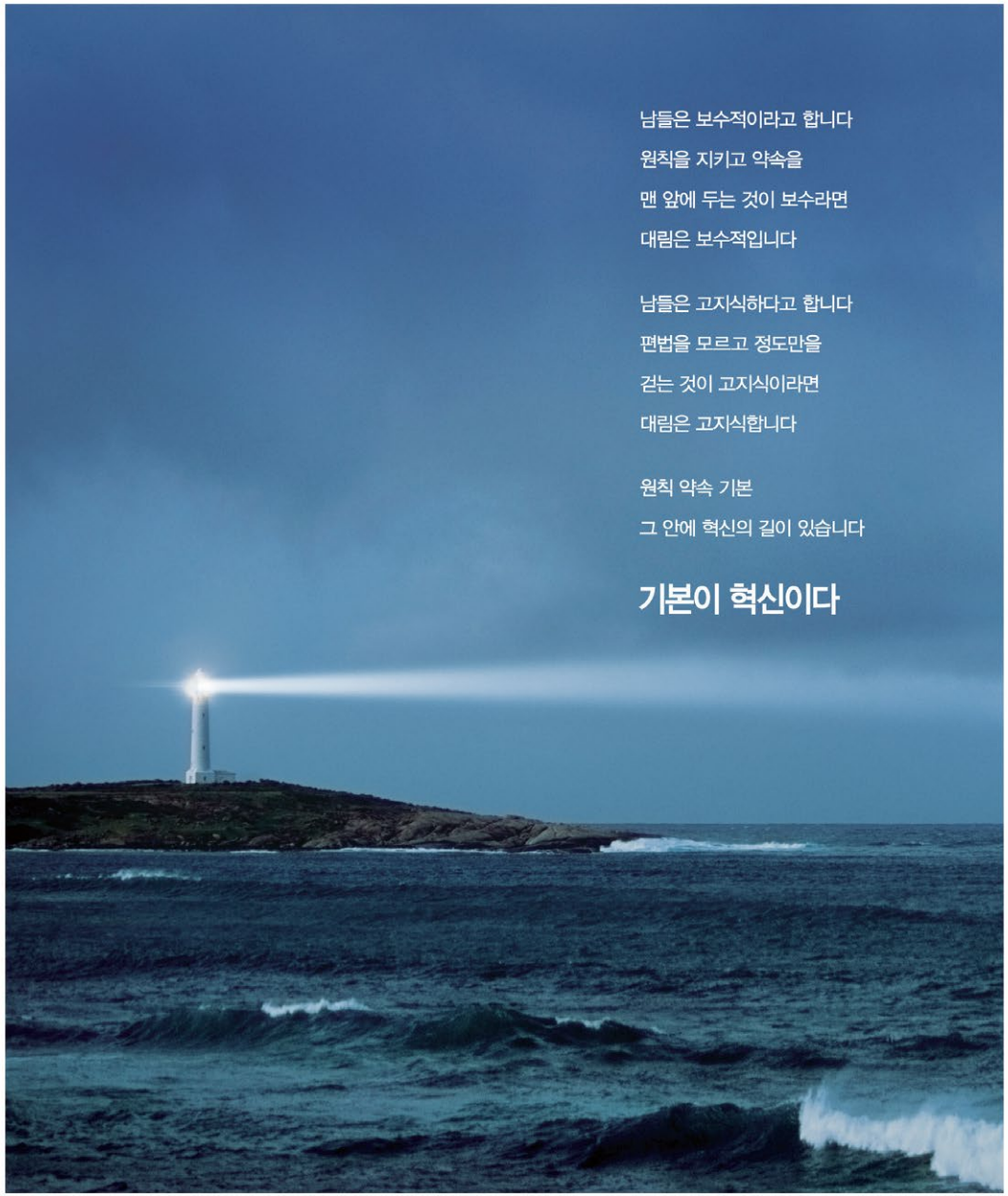
Daegu Metropolitan City
Korea Water Resources Association
K water Korea Water Resources Corporation

Supported by

Ministry of Environment

Sponsored by

KHNP
COLETANCHE by AXTER
TAEYOUNG E&C
DL E&C
KUMHO E&C
Youngjin
Hanwha E&C
KOLON GLOBAL CORP.
HYUNDAI ENGINEERING & CONSTRUCTION
GS E&C
ICD Group Company SSANGYONG
DAEWOO E&C
saman Saman Corp.
DAHIM
HS HASONG
LUBILITE
株式會社 大昌 DAECHANG CO.,LTD.
GODUK
SOOSUNG ENGINEERING & CONSULTING
KIHS Korea Institute of Hydrological Survey
DASAN CONSULTANTS
DOHWA DOHWA ENGINEERING CO.,LTD.

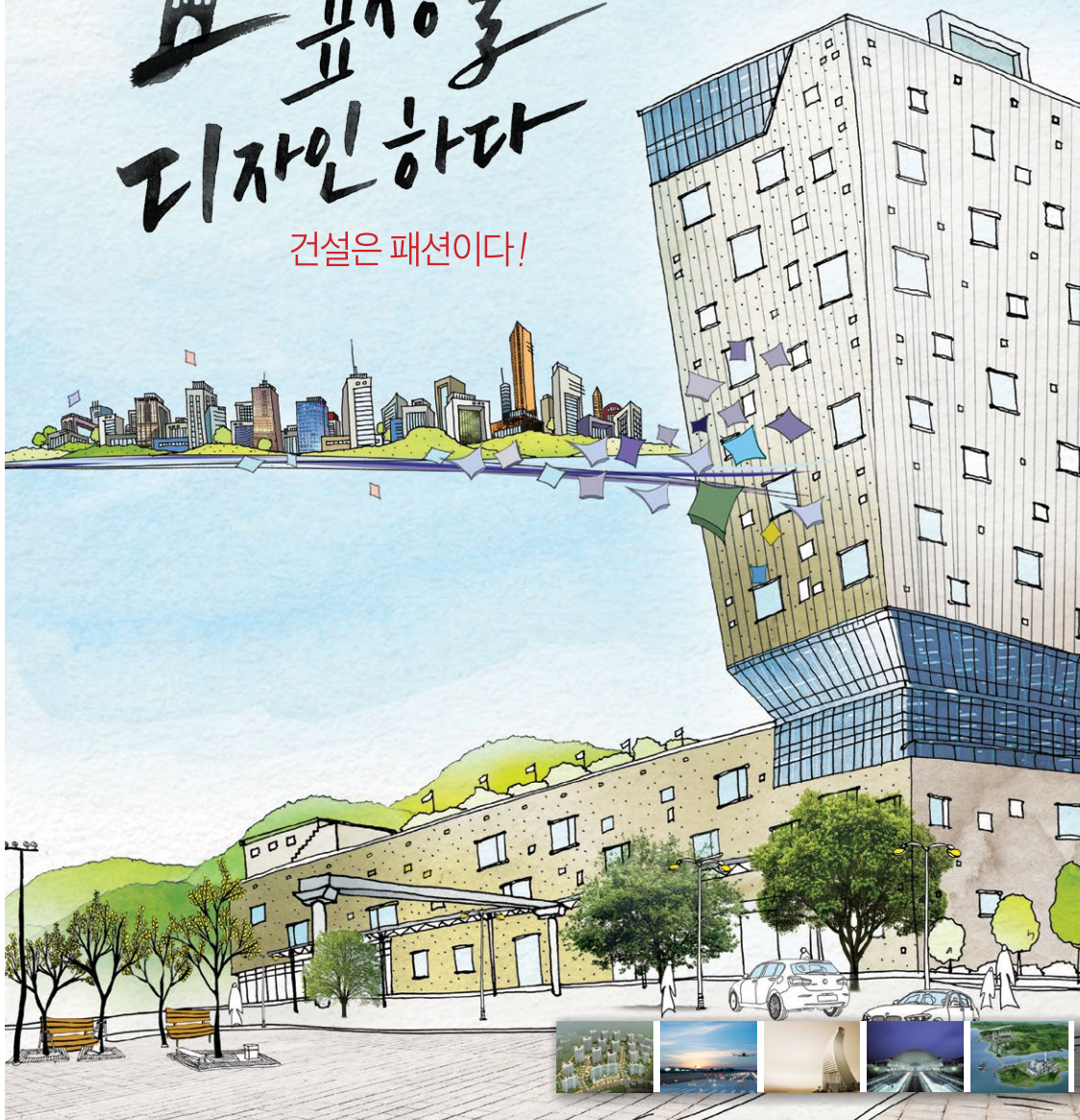


DL E&C

금호건설

도시의 표정을 디자인하다

건설은 패션이다!



Youngjin 영진종합건설주식회사
YOUNGJIN CONSTRUCTION INC.

Do Create
Do not Build

Korea Offices

- **Daegu(Head Office)**
  105 Hyeonchung-ro Nam-gu
- **Seoul**
  #516 260 Songpa-daero Songpa-gu Seoul. ZIP. 05719

Overseas Offices

- **Vietnam**
  3rd Floor B Tower Keangnam Landmark Building
- **Poland**
  Konarskiego Street 10/62 44-100 Gliwice
- **East Timor**
  Rua De Manleuana Fomento II
- **Uganda**
  Ministry 's Village Ntinda, Matyres'close Plot 8
- **Cambodia**
  Expected

KOLON GLOBAL CORPORATION

Global Biz. Organizer

상상의 한계를 넘어
고객의 미래가치를 실현해가는 코오롱글로벌
모든것을 새롭고 다르게 변화시켜가는 기업
무한한 가능성을 창조하는 기업

코오롱글로벌이 더 큰 세상을 열어가겠습니다.

Sustainability Management

www.kolonglobal.com
과천본사 경기도 과천시 코오롱로 11 코오롱타워 Tel.02)3677-3114 Fax.02)3677-5601
송도사옥 인천시 연수구 송도과학로 32 테크노파크 IT센터 Tel.032)420-9111 Fax.032)420-9119

To be global standards with advanced technology

GS E&C

Apartment | Plant | Architecture | Power | Infra | Leisure

A Best Partner & First Company that earns trust by constructing the world's values with creative passion

www.ssyenc.com

Who made it?

How was it built? Who built it?
A little girl holding her father's hand,
students with their backpacks
taking pictures for fond memories.
All curious and breathless at
the new symbol of Singapore
a world-famous landmark,
the pride of Korean engineering and construction.

※ Ssangyong symbolizes the two legendary dragons.

The Miracle of 21st Century Architecture

Marina Bay Sands Hotel (Singapore)

The breathtaking Marina Bay Sands Hotel has a total of 2,511 rooms in three 57-story buildings including SkyPark. By completing the astonishing feat of engineering of erecting the buildings at a maximum inclination of 52 degrees, ten times greater than of the Leaning Tower of Pisa, Ssangyong E&C has elevated their status in the global construction arena.

ICD Group Company

SSANGYONG

Index

XVII World Water Congress
International Water Resources Association (IWRA)

Welcome Messages

Gabriel Eckstein

President of International Water Resources Association

On behalf of the International Water Resources Association (IWRA), our hosts - Daegu Metropolitan City, Korea Water Resources Association, and K-water - and our supporter - Ministry of Environment - I am delighted to see you attend IWRA's XVII World Water Congress in Daegu, Republic of Korea, from November 29 – December 3, 2021. For more than forty-five years, the triennial IWRA World Water Congresses have served as critical milestones in global, regional, and national water science and policy developments. The event has provided researchers and decision makers the necessary space and opportunity to share experiences and developments, articulate new needs and objectives, and engage in lively discussions that have positively impacted our world.

Building on IWRA's last Congress, which was held in 2017 in Cancun, Mexico under the theme of Bridging Science and Policy, in Daegu in 2021, the main theme of IWRA's XVII World Water Congress is, as you know, "Foundations for Global Water Security and Resilience: Knowledge, Technology and Policy." This theme was conceptualized with the knowledge that the Congress will take place in the post-2015 implementation phase of the United Nations 2030 Agenda for Sustainable Development, and will follow reviews of sustainable development goal (SDG) 6 at various UN High Level Political Forums. It also was developed with the expectations that the agenda will be shaped by key global events leading up to the 9th World Water Forum scheduled for Dakar, Senegal, in 2022. Accordingly, IWRA's XVII World Water Congress will serve as a bridge between these important events, and will engage with scientific, engineering, legal, financial, social, cultural, policy, and political aspects of SDG implementation by the public and private sectors, as well as by civil society.

Since its creation in 1971, IWRA has been recognized as a global thought leader on water resources management. It has also been responsible for spearheading numerous initiatives on smart water management, water pollution, water security, integrated water management, and other efforts. In Daegu in 2021, IWRA will continue its commitment to bring together knowledge makers and policy makers working in the water sphere, and to further enhance water resources management around the world. Accordingly, I welcome to IWRA's XVII World Water Congress and wish you a productive and fruitful well.

Han, Jeoung Ae

Minister of Environment, The Republic of Korea

It gives me a great honor that IWRA's XVII World Water Congress will be held in the world's leading water industry city, Daegu, Republic of Korea, from 29 November to 3 December 2021.

Water is the essence of our life that is vital not only for humans but also for nature.

Throughout history, water investments and management have been crucial contributions to the evolution of human civilization and life. Ensuring safe drinking water also has always been our basic human right.

Water security, accordingly, has been one of the defining challenges of our time. This challenging outlook on water security, with an increased severity in floods and droughts brought about by climate change, is an urgent call for better managing water risks.

Korean government, as part of efforts for resolving those challenges, has driven and settled the integrated water management by applying reasonable and balanced policy in order to leave no one without access to safe drinking water.

Our policy for integrated water management reflects the vision for safe water supply as well as being an innovative water industry powerhouse. Technology advancement derived from the 4th industrial revolution has expanded the scope of water industry as well.

Korean water industry recently has also widened its scope by encompassing smart water management and water related energy sector. In recognition of significant development of water industry development, Korean Ministry of Environment has supported the competent actors in public and private sector for their global expansion.

I sincerely believe that the 17th IWRA World Water Congress will provide the right place for sharing knowledge and experiences accumulated as well as introducing advanced technologies.

I truly hope the results of our sharing and discussion during the congress in 2021 eventually contribute to achieve the Sustainable Development Goals.
I cordially express my appreciation for your support and participation at the 17th IWRA World Water Congress 2021 in Daegu.

Kwon Young-jin

Mayor of Daegu Metropolitan City

On behalf of Daegu Metropolitan City and our 2.5 million citizens, it is my great pleasure to announce that IWRA's XVII World Water Congress will be held in Daegu, Republic of Korea, from November 29 – December 3, 2021.

Daegu has deep interest in global water issues and water industry development since the city successfully hosted the 7th World Water Forum in 2015. Recognized as Korea's water hub, Daegu city continues to forge global partnership in efforts to solve global water challenges by annually hosting the Korea International Water Week and World Water Cities Forum. We are also establishing the Korea Water Cluster which is the core infrastructure for sustainable and innovative water technology development.

We are now facing a real, global water crisis. About 700 million, a 10th of the whole population on earth still do not have enough access to clean water. In developing countries, almost 80% of diseases are coming from contaminated water, which ultimately kills a thousand children every day. What's worse, the world population is expected to reach 9 billion by the year 2050. That would drive up water demand almost 40% and put 25% of people on earth under serious water shortage.

Water crisis is a global crisis. It's no longer a small issue simply handled by a city or a country. This requires us now to make effective water management and share our thoughts for water saving, equal access to water supply in different regions and social class.

In this regard, it is very meaningful to have IWRA's XVII World Water Congress under the theme of "Foundations for Global Water Security and Resilience: Knowledge, Technology and Policy". For five days, water experts, institutions, public and private sector and citizens will share know-how and expertise in solving water problems and overcoming water crisis. It will give participants a great opportunity to share experiences, promote discussion, and present new knowledge, research results and new developments regarding effective water resource management and equitable water supply.

I firmly believe that the Congress will create a concrete, dynamic and fruitful meeting to make a real impact on water resource management around the world.
I'd like to seek your support and active participation in IWRA's XVII World Water Congress.
I look forward to welcoming you to Daegu, Republic of Korea in 2021!

DEGHYO BAE

President, Korea Water Resources Association

On behalf of the Korea Water Resources Association (KWRA), it is my great pleasure to express sincere welcome to IWRA's XVII World Water Congress, which will be held in Daegu, Korea from November 29th to December 3rd, 2021.

The Congress will be held with the central theme "Foundations for Global Water Security and Resilience: Knowledge, Technology and Policy", highlighting the role of water in sustainable and resilient development. Essential for life and fundamental for social development, water is foundational to sustaining the world. Sustainable development requires not only resources, but also changes that must occur at various levels, and these changes require resilience. The key to sustainable and resilient water management lies in innovative technologies as well as social changes implemented by water policies. Consequently, the solutions require contributions from different sectors and disciplines. In this regard, I hope that IWRA's XVII World Water Congress will act as a platform to share our visions, knowledge, and experiences across all aspects of sustainable water development and management.

Founded in 1967, KWRA has been promoting the scientific knowledge and leading the policy-making for water resources management in Korea. In doing so, close cooperation with international communities has always been one of the top priorities. KWRA, in collaboration with International Water Resources Association, will make every effort for IWRA's XVII World Water Congress to be successful.

We cordially welcome all participants, convinced that the outcomes of the Congress will be fruitful and an important step to continue creating innovative approaches towards sustainable water development and management. Participants in this Congress will also be pleased to enjoy Daegu and its vicinities where historic spirit of Korea lives on.

Thank you.

Jae Hyeon Park

President & CEO of K-water

I would like to express my gratitude for your keen interest in IWRA's XVII World Water Congress, an international event aims to solve global water problems which will be hosted in Daegu, the water-centered city of the Republic of Korea.

Recently, the importance of water security and resilience has been growing as demand for water has dramatically increased due to complex issues such as drought caused by global warming, population growth, economic development and the urbanization of developing countries. In particular, a severe regional imbalance of water resources exists due to the disproportion between freshwater (accounts for only 0.7 percent of the Earth's water resources) and precipitation which is mostly concentrated in the areas where less than a third of the world's population lives. ĐWater and EnergyĐ(UN World Water Development Report-2014) predicts that 40 percent of the world's population will suffer from severe water shortages in 2025. This crisis is calling on us to take a more integrated view of dealing with water management and promote international cooperation.

K-water, a co-host organization of IWRA's XVII World Water Congress, is promoting joint research with the Asia Water Council (AWC) and the UNESCO International Centre for Water Security and Sustainable Management (i-WSSM) on international policies for securing water security and sustainable growth. K-water, as the chair of the AWC, Asia's largest water consultative body, has not only been leading the way in solving global water issues but also conducting a number of technology exchanges with foreign water organizations as well.

During IWRA's XVII World Water Congress, K-water will share the collaborated research outcomes, successful policies, technologies and know-how accumulated over the past 50 years, and contribute to finding practical measures for both developing and underdeveloped countries. In addition, we will inherit and develop the outcomes produced by IWRA's XVII World Water Congress into the 2nd Asia International Water Week which will be held in Indonesia October, 2021 to contribute to securing global water security and sustainable growth beyond Asia.

Through this Congress, we look forward to bringing various ways of cooperation from water stakeholders around the world to come up with a more reasonable and balanced solutions to the water problems. Lastly, I sincerely appreciate all the hard work and devotion that is required for this meaningful event to be successful.

Programme Overview

Day 01 Monday 29 November 2021

Time	Monday 29 November				
Session (Live-streaming)	S1	S2	S3	S4	S5
Room	320	321	322	323	314
09:30-10:00	Plenary Session PL1 – Opening Ceremony (09:30-11:30 / 5F Auditorium)				
10:00-10:30					
10:30-11:00					
11:00-11:30					
11:30-12:00	Exhibition Hall Tour (11:30-12:00 / 3F Grand Ballroom)				
12:00-12:30	Plenary Session PL2 - IWRA Awards Ceremony (12:00-13:15 / 5F Auditorium)				
12:30-13:00					
13:00-13:30	Lunch (13:15-14:30 / 5F Convention Hall)				
13:30-14:00					
14:00-14:30	Poster Session PS1 (14:00-14:30 / 3F Grand Ballroom)				
14:30-15:00	SS1-1 The World Bank	SS1-2 GIWP/IWRA China Chapter	SS1-3 University of Strathclyde/ University of Aberdeen/ International Water Management Institute	SS1-4 World Water Council	
15:00-15:30					
15:30-16:00					
16:00-16:30	Poster Session PS2 (16:00-16:30 / 3F Grand Ballroom)				
16:30-17:00	SS2-1 WWF China	SS2-2 UNESCO	SS2-3 University of Strathclyde/ University of Aberdeen/ International Water Management Institute	SS2-4 Water Policy Group	SS2-5 IWRA
17:00-17:30					
17:30-18:00					
18:00-19:00	Welcome Reception (18:00-20:00 / B1F, Grand Ballroom A, Hotel Inter-burgo EXCO)				
19:00-20:00					

Day 02 Tuesday 30 November 2021

Time	Tuesday 30 November							
Session (Live-streaming)	S1	S2	S3	S4	S5	Daegu City Forum		
Room	320	321	322	323	314	325	324	306
09:00-09:30	Plenary Session PL3 - High Level Panel 1 : "50 Years of Water Resource Management - Past, Present and Future" (09:00-10:00 / 5F Auditorium)							
09:30-10:00								
10:00-10:30	Break							
10:30-11:00	General Session GS1-1	General Session GS1-2	General Session GS1-3	General Session GS1-4	General Session GS1-5			
11:00-11:30								
11:30-11:45								
11:45-12:00	Change-over							
12:00-12:30	General Session GS2-1	General Session GS2-2	General Session GS2-3	General Session GS2-4	General Session GS2-5			
12:30-13:00								
13:00-13:30	Lunch (13:15-14:30 / 5F Convention Hall)							
13:30-14:00								
14:00-14:30	Poster Session PS3 (14:00-14:30 / 3F Grand Ballroom)							
14:30-15:00	SS3-1 UNESCO i-WSSM		SS3-3 INBO	SS3-4 University of South Australia				
15:00-15:30								
15:30-16:00								
16:00-16:30	Poster Session PS4 (16:00-16:30 / 3F Grand Ballroom)							
16:30-17:00	SS4-1 Korea Institute of Civil Engineering and Building Technology	SS4-2 IWRA	SS4-3 INBO	SS4-4 University of South Australia	SS4-5 Innovation Centre Denmark			
17:00-17:30								
17:30-18:00								
18:00 - 19:00								

Day 03 Wednesday 1 December 2021

Time	Wednesday 1 December						
Session	S1	S2	S3	S4	Daegu City Forum		
Room	320	321	322	323	324-B	324-A	306
09:00-09:30	Plenary Session PL4 – High-level Panel 2: Delivering SDG Outcomes: 5 Years on and Looking to 2030 (09:00-10:00 / 5F Auditorium)						
09:30-10:00							
10:00-10:30	Break						
10:30-11:00	General Session GS3-1	General Session GS3-2	General Session GS3-3	General Session GS3-4			
11:00-11:30							
11:30-11:45							
11:45-12:00	Change-over						
12:00-12:30	General Session GS4-1	General Session GS4-2	General Session GS4-3	General Session GS4-4			
12:30-13:00							
13:00-13:30	Lunch (13:15-14:30 / 5F Convention Hall)						KIWATEC Water Industry Certification Seminar
13:30-14:00						Youth Water Talk Concert	
14:00-14:30	Poster Session PS5 (14:00-14:30 / 3F Grand Ballroom)						
14:30-15:00	SS5-1 Seoul National University of Science and Technology	SS5-2 International Water Industry Conference	SS5-3 Chungnam National University/ UNESCO				
15:00-15:30							
15:30-16:00							
16:00-16:30	Poster Session PS6 (16:00-16:30 / 3F Grand Ballroom)				World Water Cities Forum		
16:30-17:00		SS6-2 OECD	SS6-3 AIDA/Geneva Water Hub/ University of Geneva/IUCN	SS6-4 IWRA/K-water and AWC			
17:00-17:30							
17:30-18:00							
18:00-19:00	Gala Dinner (Ticket Required) (18:30-20:30 / 5F Convention Hall A)						
19:00-20:00							
20:00-20:30							

Day 04 Thursday 2 December 2021

Time	Thursday 2 December		
Session	S1	S2	S3
Room	306-A	306-B	314
09:00-09:30	Plenary Session PL5 – High-level Panel 3: Water Related Data, Technology & Capacity Building for Developing Countries (09:00-10:00 / 5F Auditorium)		
09:30-10:00			
10:00-10:30	Break		
10:30-11:00	General Session GS5-1	General Session GS5-2	General Session GS5-3
11:00-11:30			
11:30-12:00	Change-over		
12:00-12:30	General Session GS6-1	General Session GS6-2	General Session GS6-3
12:30-13:00			
13:00-13:30	Lunch (13:15-14:30 / 5F Convention Hall)		
13:30-14:00			
14:00-14:30	Poster Session PS7 (14:00-14:30 / 3F Grand Ballroom)		
14:30-15:00	Special Panel: Water Associations Roles, Values, and Expectations in the Modern World (14:30-16:00 / 5F Auditorium)		
15:00-15:30			
15:30-16:00			
16:00-16:30	Poster Session PS8 (16:00-16:30 / 3F Grand Ballroom)		
16:30-17:00	Plenary Session PL6 – Closing Ceremony (16:30-18:00 / 5F Auditorium)		
17:00-17:30			
17:30-18:00			

Plenary sessions

Opening Ceremony

- **Date :** Monday 29 November 2021, 9:30-11:30
- **Venue :** 5F, Auditorium, EXCO

Welcome Remarks

- Gabriel Eckstein , President, International Water Resources Association
- Deghyo Bae , President, Korean Water Resources Association
- Hong Jeong Kee , Vice Minister, Korean Ministry of the Environment
- Kwon Young-jin , Mayor of Daegu, Daegu Metropolitan City
- Jae Hyeon Park, President & CEO, K-water

High Level Speakers

- H.E Serigne Mbaye Thiam, Minister of Water and Sanitation, Republic of Senegal
- Virginijus Sinkevičius, European Commissioner for the Environment, European Union (rec)
- H.E. Mr. TIAN Xuebin, Vice Minister, Chinese Ministry of Water Resources (rec)
- Gilbert F. Houngbo, Chair, UN Water / President, International Fund for Agriculture Development (rec)
- Armida Salsiah, Under-Secretary-General, United Nations / Executive Secretary, UN-ESCAP (rec)
- Loïc Fauchon, President, World Water Council
- Aziza Akhmouch, Head of Cities, Urban Policies and Sustainable Development, OECD (rec)
- Sasha Koo Oshima, Deputy Director, Land and Water Division, FAO (rec)
- Jennifer Sara, Global Director, Water Global Practice, World Bank
- Shin Bongwoo, Director, UNESCO i-WSSM

World Water Envoys

- Georgina Mukwirimba (Zimbabwe) – Water Supply
- Deepesh Jain (India) – Safety water and sanitation
- Maria Almonte (Dominican Rep.) – Urban river management
- Bayan Khalaf (Palestine) – Agrochemical pollution
- Pallavi Pokharel (Nepal) – Groundwater pollution

Closing Remarks

- Gary Jones , Chair, International Scientific Committee of XVII Congress

IWRA AWARDS CEREMONY

- **Date :** Monday 29 November 2021, 12:00-13:15
- **Venue :** 5F, Auditorium, EXCO

- Ven Te Chow Memorial Lecture Award by Prof. Soontak Lee
- Presentation of Crystal Drop Award, Water Drop Award
- Presentation of New Honorary Members, New Fellow Members, Best Paper Awardees of *Water International*

Ven Te Chow Memorial Lecture Award

IWRA has established a Chow Memorial Lecture program to honor its first president as well as provide for an outstanding lecture, to be delivered at its triennial World Water Congresses.
IWRA has offered the Ven Te Chow Memorial Award and Lecture since 1988 in the name of the great hydrologist who was also the Association's founder and first president.

Crystal Drop Award

For individuals or organisations in recognition of their laudable contribution to the improvement of the world's water situation. The Crystal Drop Award is awarded once every three years and presented at the IWRA World Water Congress organized by IWRA.

Water Drop Awards

The Water Drop Award recognises since 2020 a student or early career professional, typically under the age of 35, who has made an innovative contribution to the water sector. These contributions may include, but are not limited to ground breaking recent research on water issues, entrepreneurship in the water sector, and raising the profile of younger people in the water sector.

Membership Awards

New Honorary Members : Honorary Membership is the highest honour IWRA can bestow and is awarded to those who have made significant contributions to the field of water resources and/or attained acknowledged eminence in some field of water resources. IWRA Honorary Membership provides free membership for life to an individual.

New Fellow Members : IWRA Fellow Membership is granted to an existing IWRA member who has been with IWRA for at least ten years and has either made major contributions to the Association, has held a position of high responsibility, has attained a high level of academic qualification in the field of water resources management, or has made significant contributions though their work. IWRA Fellows are eligible for discounted membership for life.

Best Paper Awardees

The Best Paper Award and honourable mention are awarded by year to author(s) based on the originality, innovation, technical quality, and contribution to water resources management of an article appearing in Water International.

High-level Panels 1

50 Years of Water Resource Management – Past, Present and Future

- **Date :** Tuesday 30 November 2021, 09:00-10:00
- **Venue :** 5F, Auditorium, EXCO

Session summary

Looking into the next 50 years, what water challenges are likely to be with us in 2071, or at least for decades to come? Especially, what ones are out of the COP-SDG spotlight but nonetheless critical? Are there sleepers or new issues on the horizon, or problems that are right in front of our eyes but not being addressed? What role can IWRA play in addressing these challenges?

Session Programmes

Welcome and Introduction	- James E. Nickum, Editor-in-Chief, *Water International*
Questions to Panelists	- Gabriel Eckstein, President, International Water Resources Association - Lesha Witmer, Advocacy, Women for Water Partnership - Yoonjin Kim, Planning Director, the Korea Water Forum - Bassel Daher, Assistant Research Scientist, Texas A&M Energy Institute; Adjunct Assistant Professor, Department of Biological and Agricultural Engineering, Texas A&M University - Georgina Mukwirimba, IWRA's World Water Envoys
Closing	- James E. Nickum, Editor-in-Chief, *Water International*

High-level Panels 2

Delivering SDG Outcomes : 5 Years on and Looking to 2030

- **Date :** Wednesday 1 December 2021, 09:00-10:00
- **Venue :** 5F, Auditorium, EXCO

Session summary

This session focuses on unlocking new potential for addressing the interconnected resource challenges of the SDGs by bridging accumulated experiences in practice, policy, and science with theories and practices to support SDGs implementation. Using pilot implementation projects (case studies) from several SDG hotspots around the globe, panel members will share lessons learned about the related science, practice and policy approaches. They will address the use of these and other, relevant case studies to achieve convergence and increased stakeholder understanding of the trade-offs associated with implementation of the SDGs. The panelists will showcase innovative methods, approaches, and practices to address the SDGs as a system of interconnected goals. It will highlight the value of bridging policy and practice in the physical and social sciences, and present ways in which to optimize existing resource use to achieve the SDGs. These shared experiences and discussions will contribute to efforts to operationalize systems-level solutions as we move toward innovative, interdisciplinary, and sustainable implementation of the SDG agenda. Documentation will include a white paper summarizing the discussions and will identify the session's specific conclusions and recommendations.

Session Programmes

Welcome and Introduction	Rabi Mohtar, Professor, American University of Beirut
Questions to Panelists	- Serigne Mbaya Thiam, Minister for Water and Sanitation, Government of Senegal - Sasha Koo-Oshima, Deputy Director, Land & Water Division, FAO - Howard Bamsey, Chair, Global Water Partnership (GWP) - Bassel Daher, Assistant Research Scientist, Texas A&M Energy Institute; Adjunct Assistant Professor, Department of Biological and Agricultural Engineering, Texas A&M University - Jong Jin Lee, Vice President and Chief Global Officer, K-water
Q&A from the audience	co-moderators (Mohtar and Ms. Asoodani)
Closing	Rabi Mohtar, Professor, American University of Beirut

High-level Panels 3

Water Related Data, Technology & Capacity Building for Developing Countries

- **Date :** Thursday 2 December 2021, 09:00-10:00
- **Venue :** 5F, Auditorium, EXCO

Session summary

The acceleration of the information age and our capacity to harness data and technologies is impacting the way that humans are able to understand and implement solutions in water resources management in unprecedented ways. The current trends in data, artificial intelligence, connectivity, remote sensing, real-time access and modelling give rise to opportunities to improve our decision making. Opportunities to work at impactful scales with a widening variety of stakeholders and platforms, including innovations and entrepreneurship are augmenting our data and technological potential. Data harmonisation, inter-operability and our ability to interpret and utilise information in a concrete manner from national sources as well as the multitude of potentially useful other sources remains an important challenge. In addition, a key limitation in developing countries remains the continuing lack of basic water resources data. Despite the steady and rapid rise of Information and Communications Technologies uptake on a global level, developing countries still lag far behind. The digital divide and appropriate data technologies remain an important problem that is further exacerbated by insufficiencies in capacity to collect, assess, use and share the necessary data to enable improved outcomes for safe water supply, sanitation and society´s ability to sustainably harness water resources to drive socio-economic development. New opportunities are created through emerging technologies and a new, unified, data policy of the World Meteorological Organization (to be approved by WMO Congress in October 2021), without forgetting the Water and Climate coalition in the framework of the SDG 6 accelerator.

Session Programmes

Welcome and Introduction	Tom Soo, Executive Director, IAHR
Keynote Speech	Dominique Bérod, Head, Earth Systems Monitoring Division, WMO
Questions to Panelists	- Pauline Mufeti, Head of Hydrological Services, Namibia - Eric Tardieu, Director General, International Office for Water - Waqas Burney, Partner Manager, Google Search (APAC)
Q&A from the audience	All
Closing	All

Special Panel: Water Associations

Roles, Values, and Expectations in the Modern World

- **Date :** Thursday 2 December 2021, 14:30-16:00
- **Venue :** 5F, Auditorium, EXCO

Session summary

In recent years, membership associations, including those in the water space, have had to adjust their operations and activities in response to various factors, most notably the information age. In fact, the value of some associations has been called into questions given that data and information is now so readily available via the Internet, and in-person conferences and discrete, hard-bound publications are being replaced by email exchanges, Skype calls, Zoom chats, open access publishing, online resource databases, and much more. So, what is the role and value of membership associations, and specifically water-focused association, in this new age? What value and benefits do these organizations offer their members in the 21st Century? And, how might they adapt to the new realities to ensure that they stay relevant? This session will feature various leaders from some of the top water-focused membership associations globally. The program will be moderated as a discussion panel that will facilitate conversation between the panelists as well as with the audience.

CLOSING CEREMONY

- **Date :** Thursday 2 December 2021, 16:30-18:00
- **Venue :** 5F, Auditorium, EXCO

Congress Summary & Conclusions	- Gary Jones, Chair, International Scientific Committee of XVII Congress - XVII World Water Congress Declaration Adoption
World Water Envoy Reports	- Georgina Mukwirimba (Zimbabwe) – Water Supply - Deepesh Jain (India) – Safety water and sanitation - Maria Almonte (Domincan Republic) – Urban river management - Bayan Khalaf (Palestine, West Bank) – Agrochemical pollution - Pallavi Pokharel (Nepal) – Groundwater pollution
XVII-XVIII Congress Handover	- Chinese handover ceremony for the following XVIII Congress with Korean co-hosts, IWRA representitives & Yuanyuan Li, 2022-2024 IWRA president
Co-host thanks and takeaway message	- Vice Mayor of Daegu City - Chair of NOC
Closing Session	- IWRA President

Social Programmes

Banquets

• Welcome Reception

Date/time	Monday 29 November 2021, 18:00-20:00
Venue	B1F, Grand Ballroom A, Hotel Inter-burgo EXCO
Access	Full-day, Student Registrants
Programme	Toast Ceremony, dinner and networking

• Luncheon

Date/time	Monday 29 November 2021 - Thursday 2 December 2021, 13:15-14:30
Venue	5F, Convention Hall, EXCO
Access	Full-day, Student Registrants

• Gala Dinner

Date/time	Wednesday 1 December 2021, 18:30-20:30
Venue	5F, Convention Hall A, EXCO
Fee	50 USD
Programme	Opening Performance, welcome speech, toast ceremony, dinner and networking

Tour Programme

• Tour Course (Supported by dcvb DAEGU Convention & Visitors Bureau)

Date/time	Friday 3 December 2021, 10:00-14:10
Fee	Free
Number of people	15 (First come first served.)
Includes	Round Transportation, Professional Tour Guide, Lunch
Courses	Donghwasa Temple – Experience of Donghwasa Temple food

Tour Course (Supported by K water)

Date/time	Friday 3 December 2021, 09:00-10:40
Fee	Free
Number of people	20 (First come first served.)
Includes	Round Transportation, Professional Tour Guide, Lunch
Courses	Busan Eco Delta City – Nakdonggang Hagooduk – Gamcheon Culture Village

Daily Programmes

Special Sessions

Day 01 Monday 29 November 2021

Time	Session	Room	Title	Organisations
14:30-16:00	SS1-1	320	The Economics of Water Quality	World Bank Group
14:30-16:00	SS1-2	321	Sustainable Management of Water Resources in China: Innovation and Application	GIWP/IWRA China Chapter
14:30-16:00	SS1-3	322	An Integrated Approach to the Governance of Shared Watercourses in Africa Session 1: East Africa Basins (Nile, Omo-Turkana)	University of Strathclyde/ University of Aberdeen/ International Water Management Institute
14:30-16:00	SS1-4	323	Collective action to achieve Water Security for Peace and Development for the 9th World Water Forum	World Water Council
16:30-18:00	SS2-1	320	The world's biggest river health initiative? Insights on large-scale ecosystem restoration, water security and resilience from the Yangtze River, China	WWF China
16:30-18:00	SS2-2	321	Groundwater management for land subsidence in an urban context	UNESCO
16:30-18:00	SS2-3	322	An Integrated Approach to the Governance of Shared Watercourses in Africa Session 1: East Africa Basins (Nile, Omo-Turkana) Session 2	University of Strathclyde/ University of Aberdeen/ International Water Management Institute
16:30-18:00	SS2-4	323	Listening to national water leaders: launch of the first Global Water Policy Report	Water Policy Group
16:30-18:00	SS2-5	314	World Water Envoys Workshop	IWRA

Day 02 Tuesday 30 November 2021

Time	Session	Room	Title	Organisations
14:30-16:00	SS3-1	320	Water security: groundwater management and governance	UNESCO i-WSSM
14:30-16:00	SS3-3	322	Train, retrain, retain: building capacities of professionals to improve water management	INBO
14:30-16:00	SS3-4	323	Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa.	University of South Australia
16:30-18:00	SS4-1	320	Large-scale fluvial hydraulics experiments	Korea Institute of Civil Engineering and Building Technology
16:30-18:00	SS4-2	321	IWRA Investing in Young Water Professionals – Towards Youth Empowerment	IWRA
16:30-18:00	SS4-3	322	Ecosystem-based Adaptation in the basins of lakes, rivers and aquifers: when green & grey makes... blue!	INBO
16:30-18:00	SS4-4	323	Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa.	University of South Australia
16:30-18:00	SS4-5	314	Urban water cycle and intelligent technologies: Danish experiences	Innovation Centre Denmark

Day 03 Wednesday 1 December 2021

Time	Session	Room	Title	Organisations
14:30-16:00	SS5-1	320	Uncertainty of water demand and supply in a changing environment	Seoul National University of Science and Technology
14:30-16:00	SS5-2	321	Innovative technologies for alternative water resources	International Water Industry Conference
14:30-16:00	SS5-3	322	Freshwater Cyanobacteria Harmful Algal Blooms: Human drivers and climate change	Chungnam National University/UNESCO
16:30-18:00	SS6-2	321	Blue cities: enhancing water security and building resilient cities	OECD
16:30-18:00	SS6-3	322	Ensuring benefit sharing and joint management of dams: the role of international water law	AIDA/Geneva Water Hub/University of Geneva/IUCN
16:30-18:00	SS6-4	323	Initiative on Global Standard Frameworks and Certification Schemes Applicable to Smart Water Cities	IWRA/K-water and AWC

General Session

Day 02 Tuesday 30 November 2021

Time	Session	Room	Moderator	Title	Presenter
10:30-11:45	GS1-1	320	Lesha Witmer Women for Water Partnership-steering committee member	Implementation of drainage network layout as a flood mitigation measure: A case study in Seoul, South Korea	Jun Shik Hwang Yeungnam University
				Regional Drought Risk Assessment Using a Gaussian Mixture Model	Jieun Kim Hanyang University
				A Study on the Correction of Rainfall Based on Machine Learning for Hydrological Application	CHUL MIN KO ECOBRAIN co.,ltd
				Impacts of measures to stimulate farmers to adapt to fresh water scarcity: how to improve measurement of relevant indicators	Stijn Reinhard Wageningen Economic Research
				The role of Traditional Ecological Knowledge in The Transformation Towards Adaptive Governance: Case Study of The Vietnamese Mekong Delta	Linh Nguyen Nagasaki University
	GS1-2	321	Dongil Seo Chungnam National University	MANIFESTATION OF ENERGETIC IMPACT LIKE A TOOL TO OPTIMIZE THE WATER EFFICIENCY IN THE CUTZAMALA SYSTEM, MÉXICO.	Alejandra Escalante Paredes National Water Commission
				Control of water pollution: a solution for restoration of the Mae Kha Canal, City of Chiang Mai, Thailand	Manoj Potapohn Chiang Mai University
				Modelling choices and social interactions with a public good threshold: Investment decisions in a polder in Bangladesh	Stijn Reinhard Wageningen Economic Research
	GS1-3	322	Christopher Scott Pennsylvania State University	Anticipatory Water Security Governance: Emerging Challenges in Himalayan and Andean Headwaters Basins	Christopher Scott Pennsylvania State University
				Toward a better estimation of catchment-wise evapotranspiration	Kyungrock Paik Korea University
				Living in a watershed: the role of traditional and local practices	Yingshan Lau National University of Singapore
				Using a mixed method approach to determine the multiple benefits provided by Sustainable Urban Drainage Systems	Roshni Jose Abertay University

Time	Session	Room	Moderator	Title	Presenter
10:30-11:45	GS1-4	323	Rabi Mohtar IWRA	Drivers for collective groundwater management: The case of Copiapó, Chile	Elisa Blanco Pontificia Universidad Católica de Chile
				Democratic Transition and the End of Water Pricing in Korean Agriculture in Comparative Perspective	James Nickum International Water Resources Association
				Water Security Index: An Application to Ulaanbaatar, Mongolia	Nomundari Erdene TU Braunschweig
	GS1-5	314	Guy Fradin IWRA	Towards an index with artificial intelligence to evaluate vulnerability to climate change in micro-watersheds in Colombia	VIVIANA VARGAS-FRANCO Universidad Nacional de Colombia
				What is the role of big data in water-related disaster mitigation?	Jonghun Kam POSTECH
				Toward Understanding the Convergence of Researcher and Stakeholder Perspectives 1 related to Water-Energy-Food (WEF) Challenges: The Case of San Antonio, Texas	Bassel Daher Texas A&M University
				Initiative development of "UNESCO certification on tap water management and quality"	Seok Gwansoo K-water
12:00-13:15	GS2-1	320	Karishma Asoodani World Water Council	Bituminous geomembrane, the blueprint to safe water resources	Pau Llinas Axter Coletanche
				Managing Water Scarcity: Integration of Supply- and Demand-side Options in Kaveri River Basin	Manikanta P R Shiv Nadar University
				Enhancing Well Water Safety through University and Health Department Partnership	Yilin Zhuang University of Florida
				Preventing the Rising Tide of AMR: Utilising MOFs to Remove Antibiotics from Wastewater	Aoife Quinlivan University of Nottingham

Time	Session	Room	Moderator	Title	Presenter
12:00-13:15	GS2-2	321	Eric Tardieu OIEAU	Seawater supply network in coastal cities	Pedro Pignatelli ARCH PEDRO PIGNATELLI
				The Control of Pathogens in Stored Rainwater using Direct Electrochemical Activation	Gillian Clayton University of the West of England
				The equitable and reasonable utilization of water in international law: sustainability as a necessary element for transboundary water management assessment.	Fabiana Piccoli University of Cambridge
	GS2-3	322	Tom soo IWRA	Provisioning of water ecosystem services in Kapingazi catchment, Embu County, Kenya. Can prospects of willingness to pay improve water quality and quantity within the catchment?	Burnice Karimi Ireri Egerton University
				Development of Measured data Based Nomograph for Flood Warning System	Tae Sung Cheong NDMI
				Merging Multiple Satellite Precipitation Products in Korea by using Random Forest Model	Giang Nguyen Kyungpook National University
				DISPERSION AND TRANSPORTATION OF POLLUTANTS IN THE LOW BASIN OF THE YAQUI RIVER AND THE ENVIRONMENTAL IMPACT ON THE MARINE ORGANISMS OF THE LAKE TOBARI (GULF OF CALIFORNIA)	Sofia E. Garrido Hoyos Instituto Mexicano de Tecnología del Agua
	GS2-4	323	Asma Bachikh IWRA	Assessing the ecological restoration value of brackish water zone in Republic of Korea	HYOYEON CHOI K-water Institute
				Lessons from Water and Sanitation Policy and Plan Development in Pacific Island Countries	Ian White Australian National University
	GS2-5	314	Laura Movilla Pateiro University of Vigo	Linking Community Engagement to Transboundary Water Management	Emily Zmak CDR Associates
				Regional pathways out of national water scarcity: a regional analysis of water resources of Israel, The Palestinian Authority and Jordan.	Michael Gilmont University of Oxford
				Joint mechanism on a transboundary aquifer: a key for a successful cooperation	Raya Marina Stephan IWRA
				Collaboration to better address Climate Impacts on Water in the Canadian Columbia River Basin	Kat Hartwig Living Lakes Canada

Day 03 Wednesday 1 December 2021

Time	Session	Room	Moderator	Title	Presenter
10:30-11:45	GS3-1	320	Bassel Daher Texas A&M University	Anaerobic membrane bioreactor for Wastewater Reuse and Energy Recovery: Development and Future Challenges	Jeonghwan Kim Inha University
				Exploring water-saving potentials from food waste to managing water scarcity	Bashir Adelodun Department of Agricultural Civil Engineering, Kyungpook National University
				The Effects of Urban Flood Risk and Local River Management Policy: Comparative Case Study of Citizen Perception	Chang-Yu Hong Pukyong National University
	GS3-2	321	Dongil Seo Chungnam National University	PFAS Primer for Water Practitioners and Decision-makers	Malcolm Gander United States Department of Defense
				Distributed Storm Runoff Modeling (KIMSTORM2) Using Radar and GPM Satellite Data in Yongdam Dam Watershed of South Korea	Sehoon Kim Konkuk university
				Development of Two-Dimensional River Flow Analysis Model Using Godunov's Scheme and TVD Limiter	Euntaek Shin Department of Safety Engineering, Incheon National University
				Climate Change Impact Assessment for Small Basins with 10-min Precipitation.	Kiyoung Seong Gyeongsang National University

Time	Session	Room	Moderator	Title	Presenter
10:30-11:45	GS3-3	322	Patrick Lavarde IWRA	Sustainability of water consumption in global watersheds - current state and the effects of virtual water trade	Masaharu Motoshita National Institute of Advanced Industrial Science and Technology
				Enhancement of groundwater contamination-vulnerability assessment using DLNN method combined with optimized original DRASTIC methods	Sang Yong Chung Pukyong National University
				The water-energy-food nexus (WEF) in Pacific-Andes-Amazon altitudinal transects: towards Sustainable Development Goals	Alicia Correa Justus Liebig University
	GS3-4	323	Yeonjoo Kim Yonsei University	Assessment of Future Climate Change Impact on Groundwater Level using SWAT-MODFLOW in Geum River Basin of South Korea	Wonjin Jang Konkuk University
				Evaluation of Stream Flow and Water Quality Impact of Yeongsan River Basin by Inter-Basin Water Transfer using SWAT	Yongwon Kim Konkuk Univerity
				Rice Paddy Ecosystem Services for Climate Change using Land Use and Climate Change Scenario	Soojeong Myeong Korea Environment Institute(KEI)

Time	Session	Room	Moderator	Title	Presenter
12:00-13:15	GS4-1	320	Christopher Scott Pennsylvania State University	Application of Deep Learning and Soft Computing Methods for Prediction of Sediment Load in Reservoirs Owing to Climate Change	Muhammad Jehanzaib Hanyang University
				Role of Runoff Ratio in the Sensitivity of Streamflow	Byeong-Hee Kim POSTECH
				Application of Remote Sensing on Spatial-temporal Analysis of Soil Erosion Due to Land Use and Cover Changes: A Case Study in Yongdam Basin, South Korea.	Linh Nguyen Van Kyungpook National University
				Climate teleconnection and predictability over Midlatitude Precipitation	Jai Hong Lee USDA-NIFA, SC State University, Colorado State University
	GS4-2	321	Raya Marina Stephan IWRA	Defining Effective Transboundary Water Cooperation	Melissa McCracken Oregon State University
				Connecting the dots between law and transboundary water management: can international law accommodate the dynamics between investment, environmental protection and human rights in hydropower projects in the Lower Mekong River Basin?	Laure-Elise Mayard Northumbria University
				THE LAW APPLICABLE ON HARNESSING OF THE HYDROPOWER OF WESTERN BALKANS TRANSBOUNDARY RIVERS - An impetus for development or for new quarrels	Slavko Bogdanovic EU-LINK Consultancy Agency Novi Sad
				A MODELING PERSPECTIVE ON THE TRANSBOUNDARY NATURE OF THE ALLENDE – PIEDRAS NEGRAS AQUIFER	Laura Rodriguez texas a&m university

Time	Session	Room	Moderator	Title	Presenter
12:00-13:15	GS4-3	322	Asma Bachikh IWRA	The Damage Cost Estimation of Agricultural Drought using Reservoir Drought Index	Jinuk Kim Konkuk university
				Practical and institutional challenges to achieving improved water, sanitation and hygiene services for sub-Saharan Africa	Emmanuel M. Akpabio University of Uyo, Nigeria/University of Dundee
	GS4-4	323	Eric Tardieu OIEAU	Water level prediction using LSTM and GRU for data-scarce areas	Kola Yusuff Kareem Advanced Science and Technology Convergence, Kyungpook National University
				Water Quality and Aquatic ecology simulation of Andong Lake in South Korea Using SWAT-WET	Soyoung Woo Konkuk University
				Climate change and its impacts on the Ecosystem services.	Shiksha Bastola Kyungpook National University
				Antibiotic Resistant Genes and Integrons: A potential threat to the Ganga river ecosystem, India	MOUSHUMI HAZRA Indian Institute of Technology, Roorkee

Day 04 Thursday 2 December 2021

Time	Session	Room	Moderator	Title	Presenter
10:30-11:45	GS5-1	306-A	Lesha Witmer Women for Water Partnership-steering committee member	Application of the artificial neural network to regional frequency analysis for estimating rainfall quantiles at ungauged sites	Joohyung Lee Yonsei University
				Developing an integrated urban inundation flood model for extreme rainfall events for Metro Manila, Philippines	Lea Dasallas Chungnam National University
				Trend and Variability in Groundwater Level and Quality over South Korea (2009-2020)	Anqi Liu Pohang University of Science and Technology
				Can Disaster Adaptive Strategy Reduce Disaster Risks?: Lessons Learnt from Flood-Prone Area as Cases of 1913 and 2017 in Sri Lanka	Ryo Tsuchida Kyoto University
				Development and application of Water Security Assessment Framework	Sudharsan Malaiappan International Water Management Institute
	GS5-2	306-B	Gary John Jones IWRA	Using a novel in situ fluorescence sensor to monitor biological contamination in the Hooghly River, Kolkata, India.	Bethany Fox University of the West of England
				Improvement deionization efficiency of CDI system using highly dispersible rGO based electrode	Junho Lee, Yonsei University
				Dynamics of water quality and algal blooms in the regulated Geum River, Korea	Jaeyoung Kim Chungnam National University
				Freshwater Lens Assessment Protocol of Karst Island Water Resources-Towards an Inter-Disciplinary Approach	Robert Michael DiFilippo University of the Philippines

Time	Session	Room	Moderator	Title	resenter
10:30-11:45	GS5-3	314	Tom soo IWRA	Groundwater Pollution & Aquifer Restoration: Fundamentals and New Technical Developments in Maintaining and Improving Water	Malcolm Gander United States Department of Defense
				WhiteBox: Easy and Accurate personalized Weather Observation Station	Bong-Joo Jang KICT
				Verification of Flow Analysis Model for Tracking Sources of Water Chemical Accidents	Tae Soo Eum Department of Safety Engineering, Incheon National University
				Estimating the impacts of climate change and human activity on streamflow variability in Han River basin, South Korea	Sabab Ali Shah Hanyang University
				Water balance-based tool for drought proofing agricultural watersheds	Mohammad Faiz Alam ITC
12:00-13:15	GS6-1	306-A	Raya Marina Stephan IWRA	Drinking water, the emergence of a sustainable resource in the energy and climate transition of Bordeaux Metropole	Guy Tapie PAVE/CED/Université de Bordeaux
				Technology development for optimal operation of groundwater using existing wells to cope with drought	AMOS AGOSSOU KOOKMIN UNIVERSITY
				Development of integrated index for flood resilience	Ilpyo Hong KICT
				Rainwater Harvesting as a Resilient Approach to Mitigate Water Crisis Problem	M. Rafiqul Islam University of Verona

Time	Session	Room	Moderator	Title	resenter
12:00-13:15	GS6-2	306-B	Laura Movila Pateiro University of Vigo	Barrage and dam operations, irrigation systems, and ecological flows in the Ganga and Indus basins, India: trade-offs and opportunities	Jagdish Krishnaswamy Ashoka Trust for Research in Ecology and the Environment /Indian Institute for Human Settlements (IIHS)
				Estimation of environmental flows from an ecological engineering perspective.	Sung-Uk Choi Yonsei Univeristy
				Rainwater harvesting: A successor to human well-being	Arnold Rafiq Pakmission Society
	GS6-3	314	Karishma Asoodani World Water Council	Three-dimensional Perspective Analysis of Spatio-Temporal Drought Characteristics for Developing a Drought Risk Map	Jiyoung Yoo Hanyang University (ERICA)
				Developing a Non-stationary Drought Index Using a Generalized Additive Model for Drought Risk Assessment	Muhammad Jehanzaib Hanyang University
				Bias Correction of Daily Satellite-Based Precipitation Data Using the Convolutional Neural Network Model	Xuan Hien Le Kyungpook National University

Poster Session

Day 01 Monday 29 November 2021

Time	Session Location	Title	Presenter
14:00-14:30	PS1-1	GRID Based Rainfall-Runoff model on Flexible Cloud platforms	Young-Jin Won HermeSys
	PS1-2	Development of a user-friendly web application for providing stochastically simulated rainfall time series	Dongkyun Kim Hongik University
	PS1-3	Qualitative risk assessment in the use of water stored in cisterns by rural communities in the Brazilian semiarid region.	Alba Lemos National Health Foundation
	PS1-4	Efficient water allocation plan of domestic and industrial water in the Han River basin	Jieun Kim Hanyang University
	PS1-5	From community to community: collective participation in improving water quality in Jaqueira/PE, Brazil.	Alba Lemos National Health Foundation
	PS1-6	Numerical analysis of bahaviour of alternate bars in the channel with oblique wier	Gijung Kim Korea National University of Transportation
	PS1-7	COMPARISON OF ACCURACY OF AREAL RAINFALL BETWEEN RAIN GAUGE AND RADAR	Seokhwan Hwang KOREA INSTITUTE of CIVIL ENGINEERING and BUILDING TECHNOLOGY
	PS1-8	Estimation of Inundation Risk Index for Providing Flood Risk Information	Narae Kang KOREA INSTITUTE of CIVIL ENGINEERING and BUILDING TECHNOLOGY

Time	Session Location	Title	Presenter
16:00-16:30	PS2-9	Development of Framework for Resilience to Seasonal Operation in Hydro-power Dams	Dong Hyun Kim Hongik University
	PS2-10	Comparison of quantile mapping, random forest and deep learning for bias correction of GCMs	Song Young Hoon Seoul National University of Science and Technology
	PS2-11	Development of continuous low concentration hypochlorous acid generator customized to green biotechnology industry	Jiyoon Kim Yonsei University
	PS2-12	Changes in the Winter-Spring Center Timing Over Four Major River Basins in Pakistan Shahid Ali*, Jonghun Kam**	Shahid Ali Pohang University of Sceince and Technology
	PS2-13	Application of Hydro-Economic Optimal Water Allocation Model: Case Study on Namhan River Basin in South Korea	Gimoon Jeong Kyung Hee University
	PS2-14	Hydrologic design for sand dam construction at the small valley in upstream area	Il-Moon Chung Korea Institute of Civil Engineering and Building Technology
	PS2-15	Trend and Probable Change Point in the Hydrologic Regime of Seomjin River, South Korea (1997-2020)	Yeonjin Son Division of Environmental Science and Engineering, POSTECH
	PS2-16	Development of Waterbody Extraction Algorithm for River Surface Based on Sentinel-1	Soohyun Kim Hongik University
	PS2-17	Water balance Change of the Han River Basin by climate change	Yongchan Kim Hongik University
	PS2-18	Emphasizing Gender Equality and Social Inclusion Approaches in Sanitation Interventions to Increase Community Resilience in Disaster Affected Areas	Jatmoko Jatmoko Yayasan Plan International Indonesia
	PS2-93	Spatial Prioritization of Permeable Pavement Considering Multiple General Circulation Models: Mokgamcheon Watershed	Mohammed Sanusi Shiru UTM

Day 02 Tuesday 30 November 2021

Time	Session Location	Title	Presenter
14:00-14:30	PS3-19	Experimental and Numerical Investigations of Characteristics of Water Surface at a Crossing Connected Non-orthogonally with Four Channels	Woo Chang Jeong Kyungnam University
	PS3-20	Mapping 4-R's of Resilience and 6 Components of Regional Drought Planning in South Korea	Ho Jun Son Hanyang University
	PS3-21	Assessment of hydrological drought severity using hidden Markov Bayesian classifier	Tae-Woong Kim Hanyang University (ERICA)
	PS3-22	Dealing with Observed Zero Data in Hydrologic Frequency Analysis of Snow Depths	Dongwook Kim R&D Center, Burin Co., Ltd.
	PS3-23	Estimation of Future Water Deficit under Changing Climate Based on Joint Drought Management Index	Minji Kim Hanyang University
	PS3-24	Flood risk management and climate change adaptation in South Korea	Sunghun Kim Yonsei University
	PS3-25	The inference of directly connected impervious areas to direct runoff hydrographs in urban catchments	Jun Shik Hwang Yeungnam University
	PS3-26	Investigation of Drought-Flood Abrupt Alternation in the Yangtze River Basin, China	Ho Jun Son Hanyang University
	PS3-27	Contaminant Entry Point Identification in Water Distribution Network Using Travel Path Balancing Method	Malvin Samuel Marlim Kyung Hee University
	PS3-28	Evaluation of different erosion models for debris flow modeling	Lee Seungjun Chungnam National University
	PS3-29	Identification of homogeneous regions for rainfall regional frequency analysis considering typhoon events in South Korea	Hyunjun Ahn Yonsei University
	PS3-30	Combination of stochastic rainfall models to reproduce rainfall variances at the time scale of one hour to one year	Jeongha Park Hongik University

Time	Session Location	Title	Presenter
14:00-14:30	PS3-31	Assessment of GLUE likelihood indices and trend of parameter samples in ISPSO-GLUE for TOPMODEL	Jeongha Park Hongik University
	PS3-32	Effect of spatial heterogeneity of rainfall on areal reduction factors	Dongkyun Kim Hongik University
	PS3-33	Conditional Gap-filling of in-situ Soil Moisture for Continuous Water Monitoring	Minha Choi Sungkyunkwan University
	PS3-34	Analysis of urban drainage network characteristics based on Gibbs' model	Kyungjae Kim Yeungnam University
	PS3-35	Development of Flood Damage and Losses Assessment Model in Korea	Gilho Kim Korea Institute of Civil Engineering and Building Technology
	PS3-36	Simulation study of proper sample size for bivariate frequency analysis of extreme rainfall event	Kyungwon Joo Yonsei University
16:00-16:30	PS4-37	Flood forecasting using coupled long short-term memory (LSTM) and generative adversarial networks (GAN) with hybrid activation function – A Case Study for Hangang River, South Korea	Hyung Ju Yoo Hongik University
	PS4-38	Simulations of pollutant storage effects in emergent vegetated region	Inhwan Park Seoul National University of Science and Technology
	PS4-39	A Study on Snow Removal Guidelines Suitable for Regional Weather Patterns of Korea	Chan-Young Lee Korea Expressway Corporation Research Institute
	PS4-40	A Study on Snow Removal Resources Distribution Method Suitable for Regional Characteristics of Korea	Chan-Young Lee Korea Expressway Corporation Research Institute
	PS4-41	Development of a highway climate change prediction tool according to RCP scenarios	Lee Jugoang Korea Expressway Corporation
	PS4-42	Development and Application of the Evaluation Method for Ecohydrological Cycle Soundness in Korean Watersheds	Jae Beom Lee Kookmin University

Time	Session Location	Title	Presenter
16:00-16:30	PS4-43	Seasonal groundwater quality change with intensive pumping in an agricultural area, Korea	Kyoochul Ha Korea Institute of Geoscience and Mineral Resources
	PS4-44	A Multiscale Precipitation Forecasting Framework to Seasonal and Daily Extreme Rainfall Prediction	YONG-TAK KIM Sejong University
	PS4-45	Development of Heavy rain Damage Triggering Criteria Based on Machine learning	Jongsung Kim Inha univ.
	PS4-46	Simulation of synthetic snow depth time-series using stochastic weather generator	Jeongha Park Hongik University
	PS4-47	Evaluation of APEX model parameter uncertainty for runoff	In Kyo Choo Kyungpook National University
	PS4-48	Utility of deep learning model for hydrologic forecasting over dam-affected river basin	EUNMI LEE POSTECH
	PS4-49	Optimization of Water Disaster Reduction Technology in Korea's Coastal Mountainous Areas Considering Surface-Ground Water Interaction	Jae Beom Lee Kookmin University
	PS4-50	An Analysis of Flood Vulnerability by Administrative Region through Big Data Analysis	Yeong Uk Yu Kyungpook National University
	PS4-51	Early Warning System Development in Mountainous Area	Yujin Ahn Gyengsang National University
	PS4-52	Estimation of the frequency factors for probable maximum precipitation (PMP) in South Korea	Miru Seo Yonsei University
	PS4-53	Derivation of IDF curves for future periods using RCP4.5 and RCP8.5 scenarios	Heechul Kim Yonsei University
	PS4-54	Forecasting Urban Groundwater Level Decline Risk Related to the Construction Activities Near the Groundwater Level Monitoring Point of Seoul Metropolitan City Using Statistical and Deep Learning Methods	Gyobeom Kim Yonsei University; Korea Environment Institute

Day 03 Wednesday 1 December 2021

Time	Session Location	Title	Presenter
14:00-14:30	PS5-55	Introduction of smart urban flood forecasting technology based on X-band small radar network	Wansik Yu K-water Research Institute
	PS5-56	Performance comparison of outlier detection methods in smart water grid: A case study of YeongJong Island, Korea.	Kang Min Koo Sungkyunkwan University
	PS5-57	Optimization of Water Distribution Network by using Genetic Algorithm	Uchit Sangroula Sungkyunkwan University
	PS5-58	Demand based optimal selection of multi-water resources in economical and sustainable way: A case Study of Yeongjong Island, Rep. of Korea.	Kapil Gnawali Sungkyunkwan University
	PS5-59	Done-based Parameter Estimation Process for Flow Measurement	TaeGyu Ha Gyeongsang National University
	PS5-60	Use of big data analytics in machine learning to improve management of water distribution system with smart water grid in Korea	Kang Min Koo Graduate School of Water Resources, Sungkyunkwan University
	PS5-61	Recurrent Neural Network for Rainfall Analysis and Prediction	Changhyun Jun Chung-Ang University
	PS5-62	Water Network Partitioning for Smart Water Management	Khoa Xuan Bui Kyung Hee University
	PS5-63	Estimation of the streamflow during dry season using artificial neural network	Sungho Jung Kyungpook National University
	PS5-64	A study on the Development of Flow Measurement Method using Drones	Tae Hee Lee Korea Institute of Hydrological Survey
	PS5-65	A study on Evaluation of streamflow station considering the importance of station and field conditions	Eunjeung Shim Korea Institute of Hydrological Survey
14:00-14:30	PS5-66	Development of Activity Diagram for Flooding During Construction of Utility Tunnels	Eun Taek Shin Department of Safety Engineering, Incheon National University
	PS5-67	Development of Multiple-Leakage Detection Approach for Water Distribution Networks	Jeongwook Choi Department of Civil Engineering, Kyung Hee University
	PS5-68	Use of Moringa oleifera Lam. Seed and zeolite filter in the treatment of textile effluent from dye shops and laundries.	Alba Lemos National Health Foundation
16:00-16:30	PS6-69	Uncertainty Analysis of Quantitative Rainfall Estimation Based on Hydrological and Meteorological Radar	Jae-Kyoung Lee Daejin University
	PS6-70	The Estimation of Cold Wave Risk Index for Flow Measurement	Ki Sung Lee Korea Institute of Hydrological Survey
	PS6-71	A Study on the Calculation Factors for Mean Velocity of Surface Velocity Using Acoustic Doppler Current Profile(ADCP)	Lee Jae il Korea Institute of Hydrolgical Survey
	PS6-72	Bias Correction of Rainfall Ensemble Data using QM Technique	SangHyup Lee Kyungpook National University
	PS6-73	A Study on the Recharge Characteristics of Groundwater in the Jeju Samdasoo Watershed Using Stable Water Isotope Data	Hoyoon Ryu Jeju Special Self-Governing Province Development Co.
	PS6-74	Analysis of groundwater withdrawal impact on groundwater level variations using Long Short-Term Memory network	Mun-Ju Shin Jeju Province Development Corporation

Day 04 Thursday 2 December 2021

Time	Session Location	Title	Presenter
14:00-14:30	PS7-76	Suggestion of a rating curve considering hydrologic factors in tidal river	Myungjin Lee Inha University
	PS7-77	Numerical investigation of turbulent flow in a hydraulic jump at Fr = 7.5	Byungjoo Kim Gangneung-Wonju National University
	PS7-78	Field Survey on the Maintenance of Nonpoint Pollution Treatment Facilities	Heeman Kang Korea Expressway Corporation
	PS7-79	Estimating of Non-Point Pollution Load Reduction on Highway by Road Sweeping	Heeman Kang Korea Expressway Corporation
	PS7-80	Estimating Nonpoint Source Pollution Removal Effect of Road Sweeping by SWMM	Heeman Kang Korea Expressway Corporation
	PS7-81	Application of Physics-based Erosion Model for Agricultural lands	Minho Yeon Kyungpook National University
16:00-16:30	PS8-82	Effect of food waste addition to municipal wastewater treatment facility on the effulent quality	Sang-Hyoun Kim Yonsei University
	PS8-83	The Effect of an instream structure on Harmful Algal Blooms in the Geum River, Korea	Jaeyoung Kim Chungnam National University
	PS8-84	Solar-driven Electrochemical Advanced Oxidation Process for wastewater treatment	Hyoungil Kim Yonsei University

Time	Session Location	Title	Presenter
16:00-16:30	PS8-85	River Water Quality Grading and Water Pollution Assessment Based on Statistical Techniques	Kang Young Jung National Institute of Environmental Research Yeongsan River Environment Research Center
	PS8-86	Water quality prediction using climate information within a hierarchical Bayesian framework	Minkyu Jung Sejong University
	PS8-87	Controlling organic matters in tap water	Suhan Kim Pukyong National University
	PS8-88	Water quality changes in the Mid-Nakdong River due to Weir Constructions	Natnael Shiferaw Chungnam National University
	PS8-89	Study on the Satellite-based Spatial Evapotranspiration Evaluation Using Eddy Covariance Data	Yeongil Lee Korea Institute of Hydrological Survey
	PS8-90	Performance of a Rain Barrel Sharing Network under the RCP Scenarios	YOUJEONG KWON Yeungnam University
	PS8-91	Estimation of Flooded Area Based on Satellite Imagery and Terrain Data	Dongkyun Kim Hongik University
	PS8-92	Climate Change Adaptation in Water Resource Management: Variability of Hydro-Climate Variable, Rainfall to Soil Moisture, and Its Projection over South Korea	Sumiya Uranchimeg Sejong University

Daegu City Concurrent Programme

World Water Cities Forum 2021 (WWCF 2021)

- **Date :** Tuesday 30 November 2021, 16:00-19:00
  Wednesday 1 December 2021, 16:00-17:10
- **Venue :** Room 325, EXCO

Since 2015, World Water Cities Forum has been serving as an exclusive platform for city leaders and water experts to discuss water-related issues and solutions for each city and share best practices and policies related to water management. It is a forum for discussing how to utilize water management and water technology/water industry development to create an attractive, livable, resilient, and prosperous city. The 2021 WWCF will be held under the theme of 'Water Cities Cooperation and Innovation'. This year's event will feature presentations and discussions on water problems in Shaoxing, China, with Mikkeli in Finland.

World Water Cluster Leader's Forum

- **Date :** Tuesday 30 November 2021, 14:00~16:30
- **Venue :** Room 324, EXCO

The World Water Cluster Leaders Forum is held regularly to promote technological exchanges and cooperation among water clusters in various countries around the world, and is a place to promote the successful operation of national water industry clusters by sharing the conditions and experiences of success of global water clusters. The 2nd World Water Cluster Leaders Forum will discuss the cluster's digital transformation success strategy and the cluster's response plan to overcome the climate crisis.

Daegu City Concurrent Programme

KIWATEC Water Industry Certification Seminar

- **Date :** Tuesday 30 November 2021 -
  Wednesday 1 December 2021
- **Venue :** Room 306, EXCO

This seminar is hosted by Daegu Metropolitan City, and organised by the Ministry of Environment and Korea Institute for the Water Technology Certification(KIWATEC), attending more than 150 local government officials and water company certification system officials across the country.

The Water Industry Certification and Verification System Operation Seminar held on November 30 introduce and promotes the certification system to inform the legal use of water products. Also, at the "Water Industry Quality Capability Reinforcement Seminar" held on December 1, the certification system will be introduced and measures to secure water facility stability through quality management capability.

Youth Water Talk Concert

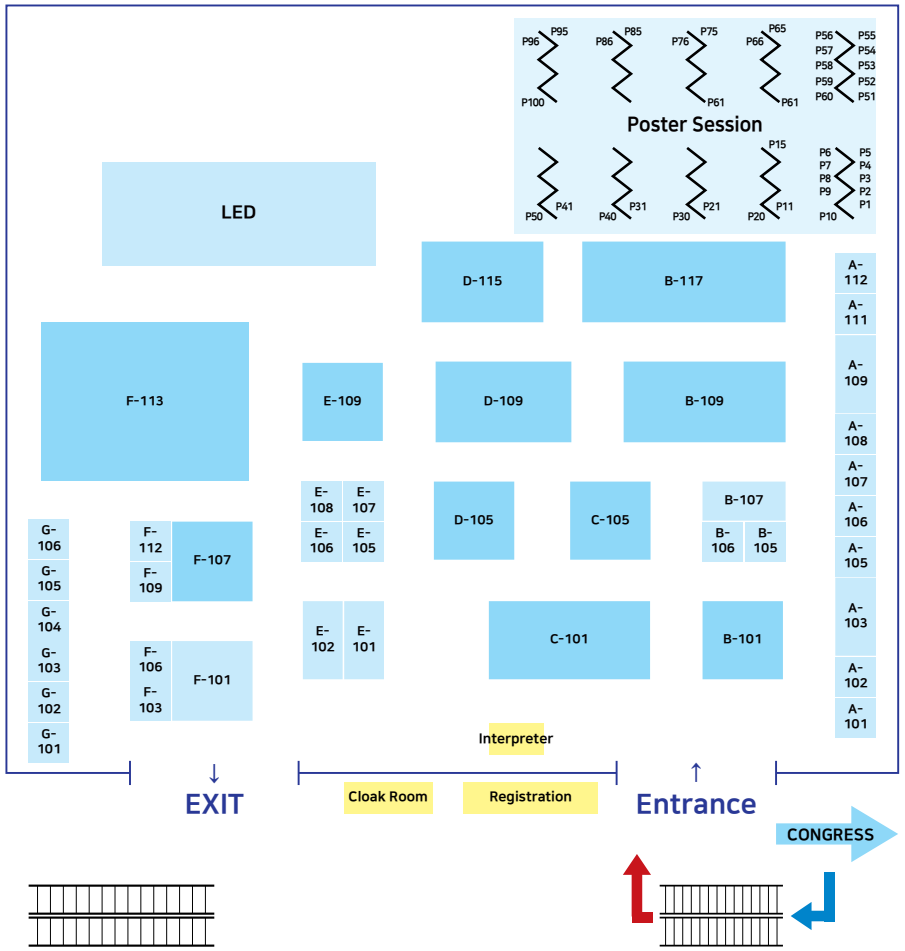
- **Date :** Wednesday 1 December 2021, 13:30~15:30
- **Venue :** Room 324-A, EXCO

Youth "Water" Talk Concert is an event where the youth from local communities can freely engage in discussions with water experts and enhance their understanding on such topics as the water industry and Daegu Metropolitan City's water industry policies, both of which might be too abstruse to be dealt with in our everyday life context. This year, it will be organized online during IWRA's XVII World Water Congress, by far the largest gathering in the field of water resources. With the participation of numerous water professionals such as Professor Hun-kyun Bae from Keimyung University and Professor Kyu-tae Seo from Changwon University as well as five hundred local students, the youth will have a chance to learn about the importance of water in our daily lives while exploring answers to some of the questions they might have regarding water in general through various activities such as the water quiz and UCC video production.

Congress Venue

Floor plan

BOOTH LAYOUT



EXHIBITOR LIST

부스번호	업체명
A-101	AXTER COLETANCHE / 엑스터
A-102	YOOIL ENGINEERING / 유일기연
A-103	JEONG WOO COUPLING CO., LTD / 정우카프링
A-105	ATT CO., LTD / 에이티티
A-106	COOGY / 쿠기
A-107	DAESAN CO., LTD / 대산전기통신
A-108	UNESCO i-WSSM / 유네스코 i-WSSM
A-109	IWRA / 국제수자원협회
A-111	EDISON / 첨단 사이언스 교육·연구 허브
A-112	DAEGU METROPOLITAN CITY - DYETEC / 다이텍연구원
B-101	ESSA CO., LTD / 에싸
B-105	KED CO., LTD / 케이디
B-106	SC Solution Global CO., LTD / 에스씨솔루션글로벌
B-107	ENERTORK CO., LTD / 에너토크
B-109	KIWATEC / 한국물기술인증원
B-117	Daegu Metropolitan City Government / 대구광역시 홍보관
C-101	ECOSET / 에코셋
C-105	Suntech Engineering Co., Ltd. / 썬텍엔지니어링
D-105	KOREA WATER CLUSTER/ 국가물산업클러스터
D-109	Water Lounge/ 워터라운지
D-115	K-water / 한국수자원공사
E-101	Korea Fluid Technology Co.,Ltd. / 한국유체기술
E-102	GREEN TECH CO.,LTD / 그린텍
E-105	Midni Co., Ltd / 미드니
E-106	SSENG CO., LTD / 생
E-107	Dong Hae Co., Ltd. / 동해
E-108	JAINTECHNOLOGY / 자인테크놀로지
E-109	Waterworks Headquarters Daegu Metropolitan City / 대구광역시 상수도사업본부
F-101	J.TECH KOREA CO.,LTD / 제이텍
F-103	KISAN MACHINERY / 기산수기
F-106	DAESUNG TECH / 대성테크
F-107	DAEGU ENVIRONMENTAL CORPORATION / 대구환경공단
F-107	TAEYOUNG FILTRATION SYSTEM CO., LTD. / ㈜태영필트레이션시스템
F-109	YOUNGWOO SCIENCE / 영우사이언스
F-112	JUDOKOREA CO., LTD / 주도코리아
F-113	Tap Water Public Relations Association / 수돗물홍보협의회
G-101	MICHIGAN TECHNOLOGY CO., LTD / 미시간기술
G-102	IOREX CO., LTD. / 이오렉스
G-103	TAEJUNG INDUSRTY CO., LTD / 태정인더스트리
G-104	Korea Green Resource / 한국그린자원
G-105	SMFAB.CO.,LTD / 에쓰엠팹
G-106	Excellent products and technologies in water industry / 물산업 우수제품등 지정제도 홍보관

Shuttle Information

• Monday 29 November 2021

Marriott Hotel → EXCO		EXCO → Marriott Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10	19:40	20:20
9:00	9:40	20:00	20:40

Toyoko-inn Hotel → EXCO		EXCO → Toyoko-inn Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10	19:40	20:20
9:00	9:40	20:00	20:40

• Tuesday 30 November 2021

Marriott Hotel → EXCO		EXCO → Marriott Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10		
9:00	9:40		

Toyoko-inn Hotel → EXCO		EXCO → Toyoko-inn Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10		
9:00	9:40		

• Wednesday 1 December 2021

Marriott Hotel → EXCO		EXCO → Marriott Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10	20:40	21:20
9:00	9:40	21:00	21:40

Toyoko-inn Hotel → EXCO		EXCO → Toyoko-inn Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10	20:40	21:20
9:00	9:40	21:00	21:40

• Thursday 2 December 2021

Marriott Hotel → EXCO		EXCO → Marriott Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10		
9:00	9:40		

Toyoko-inn Hotel → EXCO		EXCO → Toyoko-inn Hotel	
Departure	Arrival	Departure	Arrival
7:00	7:40	18:30	19:10
7:30	8:10	19:00	19:40
8:30	9:10		
9:00	9:40		

다힘건설(주)

4차 산업혁명 시대에 준비되어있는 전문건설은 '다힘건설'입니다.

철근, 콘크리트 공사
비계,구조물 해체공사
BIM 활용

대표이사 **이용광**
경기도 시흥시 시청로 72번길 8, 402호
T.031-365-5166 F.031-365-5167

친환경 수질 생태 개선
국내 기술(천연광석제품)

루미라이트
LUMILITE

LUMILITE WATER KOREA

(주)루미라이트 워터코리아

서울시 강남구 사곡로 174-10 강남에이스나워 10층 1001호

Tel : 02-6203-9311 FAX : 02-6211-4616

www.lwkorea.com

Daechang thinks about the environment.
Daechang thinks of humanity.
It is a leading company in concrete products.
Thank you.

C.E.O young hee, Park

株式會社 大昌
DAECHANG CO.,LTD.

GODUK CONSTRUCTION
고덕건설

COMPANY INSTRUCTION

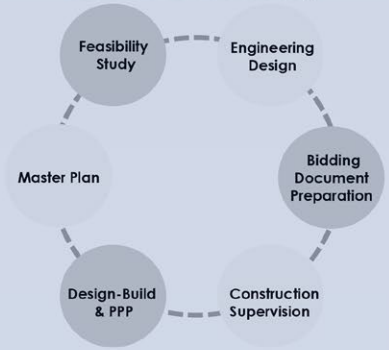
- Public Procurement Service Excellent Construction Company
- Construction Industry Packaging Award
- Korea Land and Housing Corporation excellent construction company
- Commendation by the Fair Trade Commissioner
- Construction Business Ethical Management Excellence Award
- Acquired credit rating A for 13 years

SOOSUNG ENGINEERING & CONSULTING INNOVATIVE SMART GLOBAL

SOOSUNG, since its foundation in 1991, is a multi-disciplinary engineering consulting firm in infrastructure sector with a strong presence in not only Korea, but also across international boundaries. In the field of expertise listed below, over 800 highly qualified professional engineers and specialists are working devotedly to safeguard our business mission of providing zero-defect engineering services.

- Water Resources
- Water Supply & Sewerage
- Bridge & Structure
- Road & Highway
- Railway
- Geotechnical
- Urban Planning & Development
- Traffic Planning & Management
- Airport
- Port
- Environment
- 4th Industrial Revolution

INNOVATIVE ENGINEERING SOLUTIONS
Zero-Defect Consulting



ACHIEVEMENTS

With extensive track record of overseas project experience, SOOSUNG is enlisted in the **Engineering News Record (ENR) Top 225 International Design firms of 2021**.

2021 ENR TOP 225

CLIENTS & FUNDING

SOOSUNG has achieved immense track record in not only engineering services but also managing civil works contracts under FIDIC Conditions of Contract for projects funded by Multilateral Development Banks including WB, ADB, AIIB, AfDB, EBRD and CABEI.

ADB · AIIB · European Bank for Reconstruction and Development · CABEI Central American Bank for Economic Integration

WATER INFRASTRUCTURE SECTOR

In the water sector, SOOSUNG is known for highly competent expertise especially in Master Plan, Preliminary and Detailed Design, and Construction Supervision services. Some of the most representative projects are *Nakdong River Revitalization Project Lot No. 33 (Sangju District)*, *Detailed Design for Geum River Revitalization Turnkey Project Lot No. 6 (Cheongnam District)*, and *Master Plan for Geum River Downstream*.

DOHWA

DOHWA

Create the Value, Shape the Future

2030 World Top-tier

물산업	Water
도시	Urban
철도	Railway & Metro
플랜트	Plant
수자원	Water Resources
도로공항	Road & Airport
교통	Traffic Planning
환경	Environmental Engineering
항만	Port & Coastal
구조	Structure
지반터널	Geotechnical & Tunnel
감리CM	Supervision & Management
건설·유지관리	EPC, O&M