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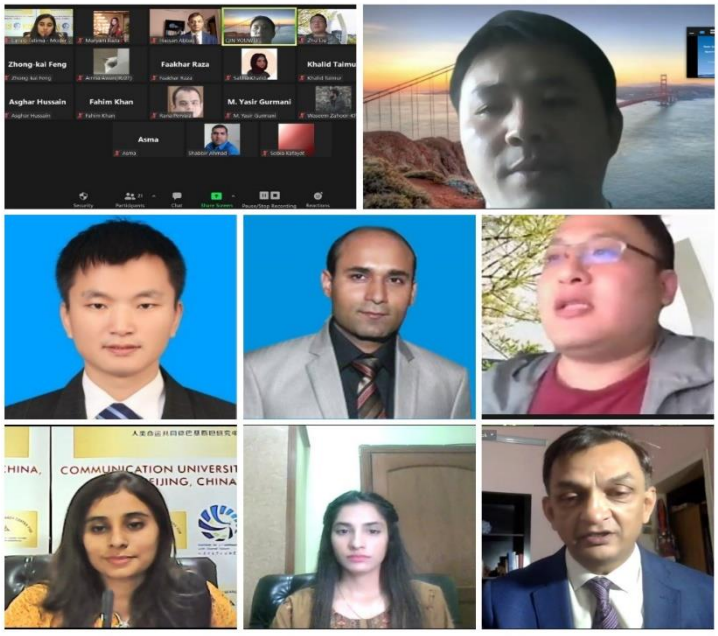
Communication University of China

Institute for a Community with Shared Future
人类命运共同体研究院

PAKISTAN RESEARCH CENTER FOR
A COMMUNITY WITH SHARED FUTURE
人类命运共同体巴基斯坦研究中心

Online International Conference Report

"Understanding Water Governance and Management Strategies: Finding Solutions for Common Challenges"



Organized by

Pakistan Research Center for a Community with Shared Future

12th April 2022

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CONCEPT NOTE

Water sustains life, economic prosperity, ecological security, and human civilization. However, rapid population growth, fast urbanization, increasing economic development, unprecedented technological innovations, drastic land-cover alterations, and climate change have led to a global water supply crisis. Worldwide, over two billion people have no access to safe drinking water and another over four billion lack access to safely managed sanitation services. Water-borne diseases lead to 250 million illnesses. More than 80% of industrial and municipal wastewater is discharged into rivers or oceans without any treatment, leading to many deaths and negatively impacting fisheries, livelihoods, and food chains. As a result, the World Economic Forum has declared the water supply crisis as one of the top five crises faced by the globe. In the face of this crisis, water resources and their management play key roles in achieving sustainable development.

Pakistan, a semiarid region and a primarily agricultural economy, is currently facing declining water availability and quality, growing water pollution, and overall environmental insecurity. The World Resource Institute placed Pakistan among the top 17 water-stressed countries. Thus, it is important to understand Water Resource Management and to draft future conservation strategies for Pakistan. A multipronged strategy that not only focuses on saving and conserving but also on optimal usage is severely required and needs proper consideration and policy check to water security issues. In this regard, we can learn from China's achievements in water governance, flood control, soil and water conservation, water supply and agriculture efficacy. In recent years, the Chinese government has taken many initiatives to improve water management, including institutional reform, the most stringent water regulation, and sponge city development. Thereby, an effort has been made by Pakistan Research Center for a Community with Shared Future to organize an Online international conference to learn from the Chinese model and adopted strategies, and find areas for mutual cooperation in water governance/management.

BREIF OF THE ONLINE INTERNATIONAL CONFERENCE

Pakistan Research Center for A Community with Shared Future (PRCCSF) organized an online international conference, **''Understanding Water Governance and Management Strategies: Finding Solutions for Common Challenges'',** on 12th April 2022. The international conference provided a premier interdisciplinary platform for relevant stakeholders and experts to discuss the most recent innovations, trends, and practical challenges encountered in water governance. The discussion integrated experts and scholars from China and Pakistan to present adopted solutions in the fields of water governance and management. The report represents a detailed analysis of the collective views and speeches of the panelists presented during the online conference. The discussion focused on multiple dimensions. The experts identified a wide range of core areas, i.e., global water security situation, sustainable water resource management in China and Pakistan, the concept of Sponge city, and China's agriculture/water policy reforms. The speakers also explored possible ways where China can assist Pakistan in this regard. The discussion has built a comprehensive analysis and cohesive measures to counter common challenges with a shared approach.

The international conference was moderated by Ms. Laraib Fatima Hassan, Communication Executive, Pakistan Research Center for a Community with Shared Future. The online event was viewed live on leading social media platforms and was attended by 40 participants, including students and experts from Pakistan and China.

SPEAKERS & SPEECH TOPICS:

1. **Dr. Hassan Abbas, Chairman Forte, Integrated Water Resources Management**
   Topic of Speech: Environmental Change and Impact on Water Reservoirs: What Needs to be Done?

2. **Prof. Youwei Qin, Associated Professor, Hohai University, China**
   Topic of Speech: China's Water Governance and Challenges: Recent Developments and Achievement

3. **Mr. Faakhar Reza, Regional Director, Pakistan Council of Research in Water Resources, Regional Office, Lahore**
   Topic of Speech: Role of PCRWR in Digitalizing the Agriculture Sector vis-à-vis Water Management, Research and Innovative Projects

4. **Dr. Zhu Liu, Associate Professor, Department of Hydrology and Water Resources, Hohai University, China**
   Topic of Speech: Sustainable Water Resource Management in China: Understanding the Concept of Sponge City

5. **Dr. Zhong-kai Feng Professor, College of Hydrology and Water Resources, Hohai University, China**
   Topic of Speech: China's Agriculture and Water Policy Reforms: How China can Assist Pakistan?

EXECUTIVE SUMMARY, ANALYSIS & KEY-TAKEAWAYS

Executive Summary, Analysis & Key Takeaways

(Based on the speeches of respective panelists)

1. Environmental Change and Impacts on Pakistan's Water Reservoirs: What Needs to be Done?

- The large reservoirs are a typical 20th-century model of managing rivers that are completely insensitive and ignorant to the environmental, ecological, and social impacts and treat the rivers only as the conduits that carry water.
- In the old model, mountainous valleys were used as temporary storage basins that now result in many of social and environmental consequences. In short, the large reservoirs are environmentally unsustainable, and they cannot handle droughts.
- In the rivers of Pakistan, large dams are built. Thus, whenever there is a short cycle of drought, the dams become immediately empty. They cannot handle large floods because dams are too small.
- In addition to that, the climate change in this region causes droughts and large floods that are expected to increase in the future. Dams destroy downstream, and upstream ecology. They have a short useful life due to silting. Indus is the fifth biggest siltiest river in the World, and Pakistan's two large reservoirs were built almost 40 years ago which are also silted.
- Silting of huge structures, which is already environmentally destructive, has a short life. The mountains through which the Indus originates are tectonically one of the most active mountains of the World.
- These mountains have recorded magnitude eight and above Earthquakes in geological history many times. Thus, the dams built in such areas are a ticking time bomb and can multiply the disaster many times more. Therefore, one of the conclusions from this preamble is that building large dams is not the solution. There

is a need to tackle climate change, and maintain people's safety and environmental sustainability.

- Moreover, the flowing water also takes much silt with it and that silt will not only replenish the soils in the planes but also replenish River Delta and make seawater intrusion.
- All the silt is stopped in reservoirs and is diverted into the canals and does not reach the delta. As a result, River Delta is eroding. However, the solution to these problems is within the government's reach.
- Pakistan has large and wide rivers running through the plains. The average width of the rivers in the active flood plains is about 6.3km, and the total area of this vast riverine corridor is about 21000 sq. km.
- Underneath that area, there is a bed of sand that contains a minimum of 400 million acre-feet of fresh, clean, and unpolluted water. Water is our major source and it is life. Thus, our investments must be prioritized to save it.
- To utilize that water, Pakistan is now working on a concept called Riverine wellfield. The efficiency of water usage in the irrigation sector is very low. However, the demand for irrigation water is very high. In this aspect, Pakistan is developing new technologies, i.e., subsurface moisture management systems which are very efficient.
- Modern systems like Aqua fair management, Riverine wellfields, and Soil moisture management systems must be adopted from lower to a higher level for sustainable development in Pakistan.
- Agriculture production and water conversation are two interconnected paradigms. It is important to include technological advancement in the agriculture sector to increase economic output in Pakistan.
- Pakistan has also developed an ICT-based irrigation advisory service for the farmers to know the vapor transportation in their respective areas along with the coefficient of crops and algorithm on irrigation required in the area.
- Pakistan has a Tile Drainage Technology to reclaim farmlands. In areas with waterlogging issues, this technology proves to be effective in draining the water for land reclamation.

- The inverted wells have also recharged the groundwater and it is a useful technology to replenish the depleting aquifers. In addition, harvesting ponds in the Cholistan desert, Hydraulic ramp pumps, and cultivation of water conservation techniques have been used at a greater level.
- For drip irrigation systems on low pressure, Pakistan has experimented with skimming wells, waterbird for automatic switching, safe water filters for domestic levels and an arsenic kit to measure arsenic contamination in water. These huge achievements have enabled our institutions to develop robust water-saving techniques in water tanks for domestic and household usage.

2. Water Security and Governance Strategies: Policies and Achievements in China

- The water security issue has become a global and important problem now. According to the Millennium Ecosystem Assessment, presently, around 1.1 billion people suffer from lack of water, and 80% of the population is threatened by water scarcity. Similarly, International Water Management Institute (IWMI) predicts that in 2025, 3 billion people will likely to suffer from water scarcity, with a devastating impact on almost 40 states globally.
- The scarcity of water resources leads to the deterioration of the water ecological environment. China has made faster economic development in the last 20 years and also solved water-related issues such as extensive water intaking from major rivers and excessive sewage discharging into rivers which causes shrinking of lakes, wetlands, seawater intrusion, land desertification, and soil erosion.
- In this aspect, Climate change is one of the most devastating challenges that causes an increase in temperature leading towards melting of glaciers and floods.
- According to a report by the Intergovernmental Panel on Climate Change (IPCC), the spatial and temporal distribution of water resources will become more uneven, causing many problems. Thus, the water shortage capacity of glaciers and snowcaps will decrease as well as the risk of heavy rain and flood will increase.

- Considering the gravity of this situation, China has made effective reforms, including the flood control safety measures and disaster reduction. Moreover, dynamic leadership has made huge achievements in the last ten years.
- China has formulated robust flood control and disaster reduction approaches to prevented from floods and water waste since 1949. The government has built dams, embankments, and a monitoring/ early warning flood scheduling system.
- For Water supply security, China has built a great water supply network system formed to utilize various water sources such as surface water, groundwater, and different water supply facilities for water storage, diversion, lifting, and regulating.
- One of the examples is the Jiangdu Water Conservancy Project, which acts as an Eastern route of South-to-North Water Diversion. Through this division, water is transferred to China's northern areas, having water shortage. It gives a guarantee of 100% availability of water for domestic use vis-à-vis enhancing agriculture irrigation system.

3. Sustainable Water Resource Management in China: Discussing the Concept of Sponge City

- China has been actively promoting building Sponge cities for water security. In this concept, the underground portion of land is assumed to be a sponge, so when the rainfall happens, it can be rapidly infiltrated underground, and later that water can be used for multiple purposes.
- Furthermore, great infrastructures, wetlands, and trees can be made on the top of the land. The sponge cities have great resilience when facing environmental changes and natural disasters.
- Over the last few decades, climate change has imposed great vulnerabilities. The rainy days have decreased sharply in the last half-century. Comparatively, the extreme rainy days and floods have increased significantly. Thus, enabling new challenges of urban floods and water sewage systems.
- To cope these threats, China has prioritized utilizing natural resources to preserve and use the rainfall water by building huge reservoirs and natural infiltrated/purified

sponge cities. Sponge city has the function of absorbing water, purify and infiltrate water when needed.

- The benefits of a sponge include water preservation during rainy seasons and extreme precipitation events. Thus, saving water while re-utilization of water resources and improving the cities' ecological systems.
- Making a sponge city includes complex steps and components, i.e., water collection facilities, water storage facilities, and water usage facilities. However, China has been doing exceptional work with greater innovation in order to build sponge cities.
- The idea of building a sponge city is a modern way to tackle the challenges of water scarcity and natural hazards. It enhances agriculture capabilities and contributes to the national development. Thus, Pakistan can also apply this concept and make sponge cities by taking Chinese expertise.

4. China's Agriculture and Water Policy Reforms: Prospects of Cooperation between Pakistan and China

- In recent years, many effective measures have been taken to promote water governance in China, e.g., the utilization efficiency improvement of agricultural water, water-saving awareness, and new countryside construction. Thus, there are four major aspects for joint collaborations between Pakistan and China.
- First, to increase the protection and conservation of agricultural water resources. In this aspect, efficient water-saving engineering and high-standard farmlands can be constructed with wastewater treatment technology.
- Second, to improve the quality of the rural water ecological environment. Reasonable and effective management measures must be taken to strengthen agriculture water management.
- Third, to optimize rural domestic sewage treatment and recover technology. Advanced technology is used to improve the quality of the agricultural water resources system.
- Fourth, to strengthen efficient water-saving and improve the utilization rate. Traditional methods must be improved by drip irrigation, sprinkler irrigation, low-pressure tube filling, and micro-spray irrigation.

- Fifth, to start water-saving awareness and formulate a legal system. The water resources management rules, regulations, laws, and policies must be gradually improved.
- The anthropological factor (human activities) and climate changes have imposed myriad implications on the water resource management system vis-à-vis changing socioeconomic fabrics of societies.
- Under the visionary leadership of President Xi Jinping, China has made great efforts and achieved success in addressing water insecurity by taking robust reforms and effective engineering and non-engineering measures.
- Thus, these useful measures may provide a comprehensive reference or model for Pakistan's agriculture sustainability and water reforms.

TRANSCRIPTS OF THE SPEECHES

Opening Remarks

Ms. Maryam Raza, Deputy Director, Pakistan Research Center for a Community for Shared Future

Greetings to all!

Before we formally commence our today's conference, I would like to give a brief introduction to the "Pakistan Research Center for a Community with Shared Future". Before, it was an integral part of CGSS and now we have launched it as a separate think tank in Islamabad. Pakistan Research Center was established in 2020 in collaboration with the Communication University of China, Beijing. This Research Center has been established under the prestigious program by the Communication University of China that is an international academic center for a community for shared future. Our center is launched as a platform to support building shared culture and enhance people-to-people connectivity which includes tourism, trade, and all other aspects, and to foster regional connectivity for example BRI, CPEC, Eurasian Region and to promote research collaboration. Our platform is formed for closer coordination between Pakistan, China, and other Research institutions to pave the way for joint ventures in multiple areas of mutual interest. Now, coming on to the main theme of today's conference which is "Understanding water governance and management strategies - Finding solutions for common challenges" and we all are aware that this theme holds a lot of significance in present times because of the rapid population growth, fast urbanization, rapid industrialization, and economic development along with climate change and other environmental issues. They all have led to the global water supply crises. Pakistan is a semiarid region and a primarily agricultural economy and it is currently facing declining water availability, growing water pollution, and environmental insecurity. So, it is important to learn from our neighboring countries like China about their achievements in water governance, flood controls, soil and water conservation, water supply, and agricultural efficacy. In recent years, the Chinese government has taken many initiatives to improve water management including institutional reforms and the most important water regulation

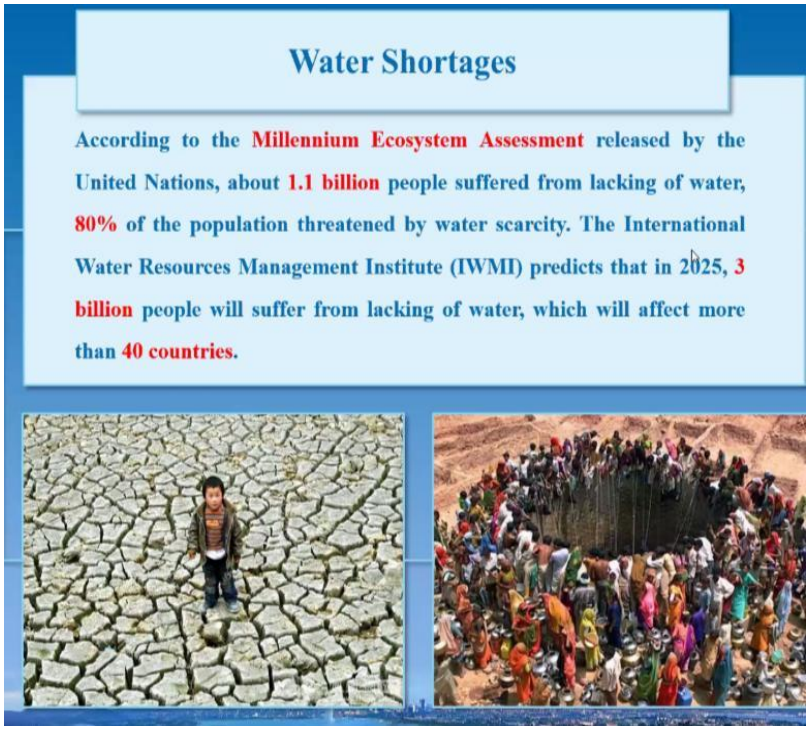
system and sponge city development. So, many aspects are important to highlight and discuss to share ideas and let's have a fruitful discussion and exchange of ideas.

Speaker 1

Professor Youwei Qin, Associated Professor, Hohai University, China

Topic: Water Governance and Challenges in China: Recent Development and Achievements

The water security issue is a global and important problem that we face together in Pakistan and China. According to the Millennium Ecosystem Assessment, today around 1.1 billion people suffer from lacking water and 80% of the population is threatened by water scarcity. IWMI predicts that in 2025, 3 billion people will suffer from lacking water, which will also affect 40 countries.

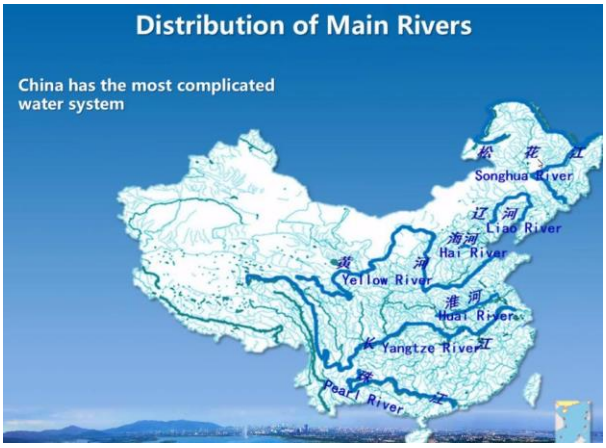


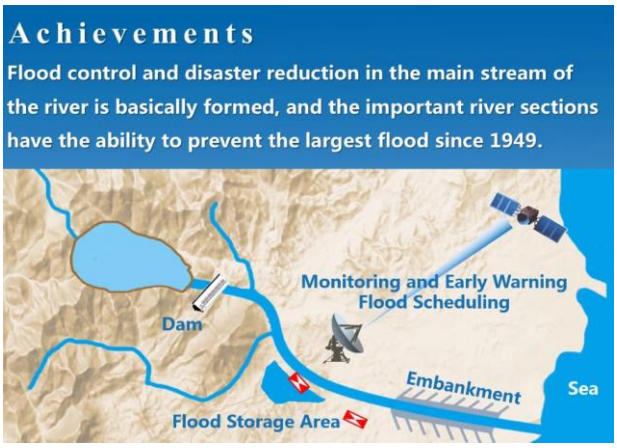
The unreasonable development of water resources leads to the deterioration of the water ecological environment. In China, we have made faster economic development in the last 20 years and also solved water-related issues such as extensive water intaking from major rivers and excessive sewage discharging into rivers which causes shrinking of lakes and wetlands, seawater intrusion, land desertification, and soil erosion.

Both China and Pakistan take a lot of water for irrigation and climate change increases uncertainty. As we know, climate change mainly causes an increase in temperature which will cause flood and drought disasters that have risen roughly in some areas. According to the IPCC report, we know that the spatial and temporal distribution of water resources will become more uneven in the future causing many problems. Water shortage capacity of glaciers and snowcaps will decrease and the risk of heavy rain and flood will increase. It has also become a global issue, and a lot of International Institutions have paid much attention to this program, for example, The Asian Development Bank wants to build a water security framework for Asian-Pacific Countries.

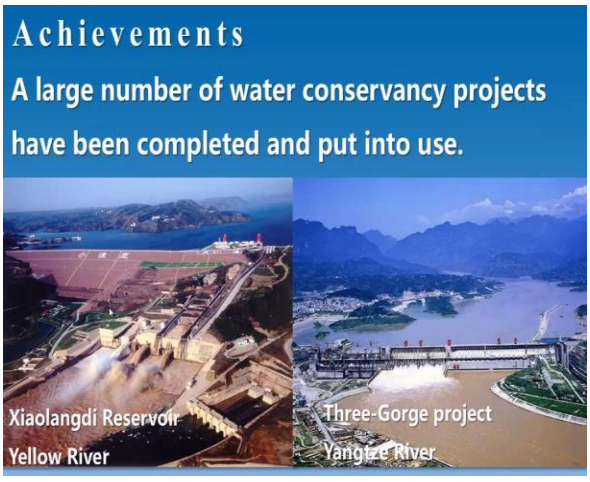
Some of the water safety situations and what China did about that include the flood control Safety as China has a complicated water system. How to deal with the flood problem along

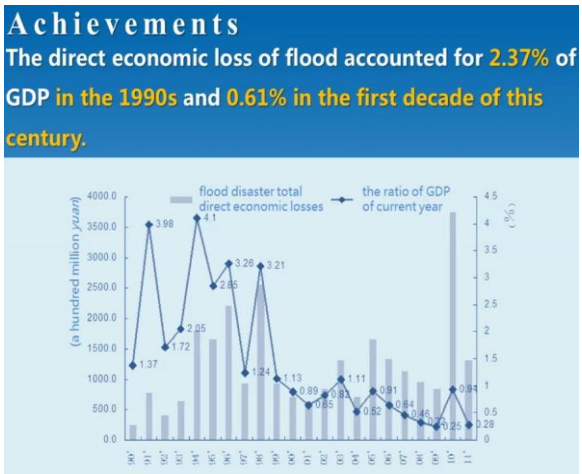
this river is very important. China has made huge achievements in the last 10 years and the most important thing we did was flood control and disaster reduction. To achieve this, along the mainstream of rivers we have formed flood control and disaster reduction approaches and important rivers can prevent the largest flood since 1949. We built up dams, embankments, and a monitoring and early warning flood scheduling system.





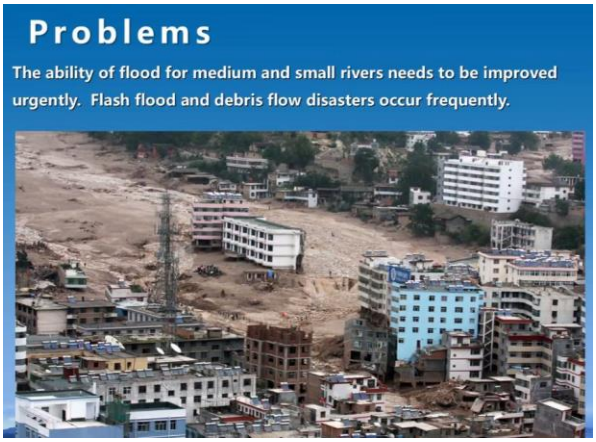
A large number of water conservancy projects for example the Xiaolangdi reservoir in Yellow River and the three-gorge project in Yangtze River have also been built. Another achievement is the saving of the direct economic loss.





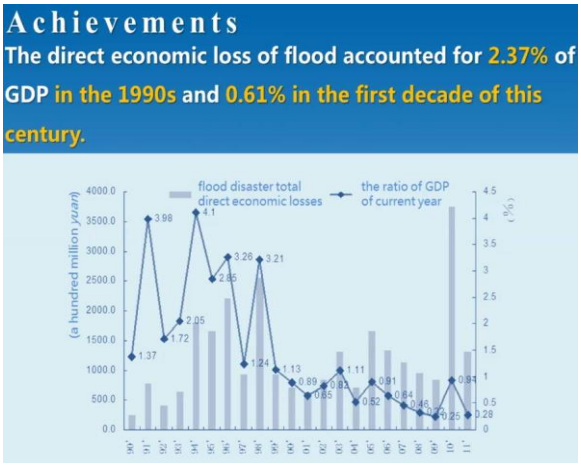
There are also some problems left, the ability of flood for medium and small rivers needs to be improved. As we know that the flash flow and debris are difficult to monitor so a lot of

efforts have been carried out to develop new methods and technologies to avoid these problems. Urban waterlogging has become a problem in big cities.



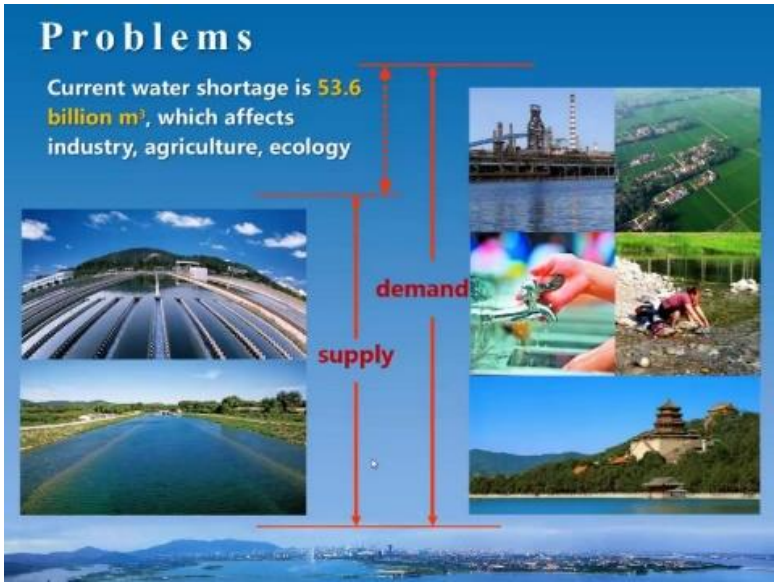
For Water supply security, we have built a great water supply network system that has been formed to utilize various water sources such as surface water, groundwater, and various water supply facilities for water storage, diversion, lifting, and regulating. The Jiangdu Water Conservancy Project acts as an Eastern route of South-to-North Water Diversion. Through this division, we transfer water to the north area that has a water shortage and by doing this we can guarantee the domestic water 100%.

The achievement here is that industrial water consumption has increased significantly and is now 144.7 billion cubic meters. One thing that can't be ignored is agricultural irrigation which was mostly stable in recent years.



Some problems occur in China in water supply. The current water shortage is 53.6 billion cubic meters which affects the industry, agriculture, and the economy. Although, we have a

lot of water transfer systems we need to focus more on the demanding part because we can take out some solutions to save water and can increase the ability of the water supply. Water and ecological pollution problems are also there but in recent years China is taking measures to deal with this through the river chief system and because of that the water quality has improved a lot.



Problems

Water usage efficiency.

Index	China	Developed Country
Utilization Coefficient of Farmland Irrigation Water	0.51	0.7-0.8
Water Consumption Per Ten Thousand Yuan of Industrial Added Value	78m³	30-40m³
Water Consumption Per Ten Thousand Yuan of GDP	129m³	70-80m³

Table of Water Efficiency Index Comparison (2011)

The water crises faced by Pakistan and China are strikingly similar. In the last 20 years, we have built reservoirs and embankments along the main rivers and we are also trying to deal with urban floods. Water safety affects agriculture, industry, and daily life and the main issue is the water usage efficiency problem. If we can solve this problem, we can save a lot of water.

Speaker 2

Dr. Hassan Abbas - Chairman Forte, Integrated Water Resource Management

Topic: Environmental Change and impact on water reservoirs: What needs to be done?

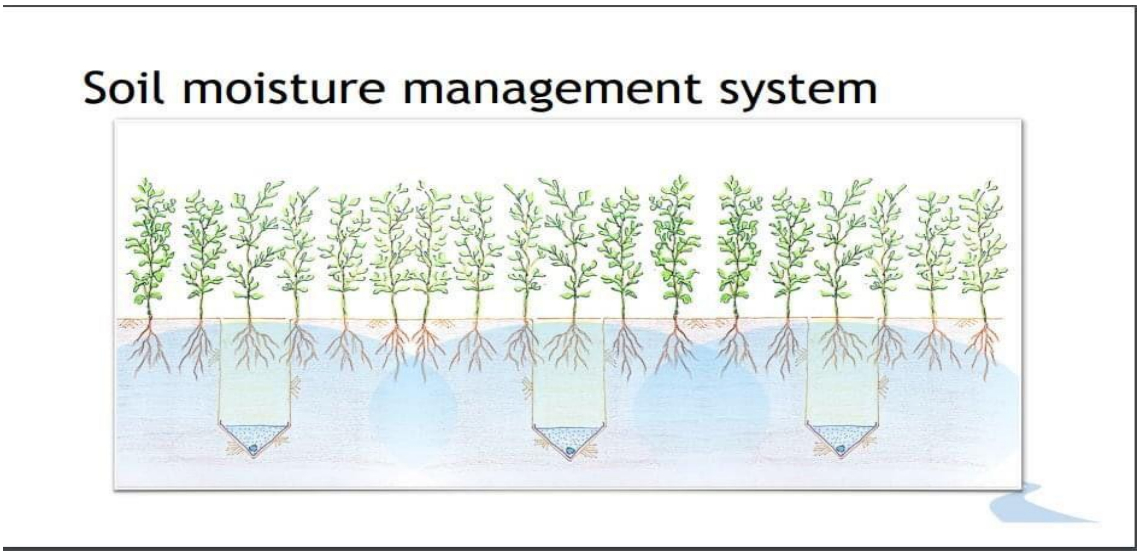
The first thing is that the large reservoirs are a typical 20th-century model of managing rivers that are completely insensitive and ignorant to the environmental, ecological, and social impacts and treat the rivers only as of the conduits that carry water. They use the mountainous valleys as storage basins and it ignores a lot of social and environmental consequences where a large lake is created by making a reservoir. In short, the large reservoirs are environmentally unsustainable and they cannot handle droughts. In the rivers of Pakistan on which we have built large dams, whenever there is a short cycle of drought the dams become immediately empty. They cannot handle large floods because our dams are too small therefore, climate change in this region predicts that the droughts and large floods would increase. Dams destroy downstream and upstream ecology and they have a short useful life due to silting. Indus is the 5th siltiest river in the World and our two large reservoirs which were built almost 40 years ago are also silted. Due to silting, this huge structure, which is already environmentally destructive has a short life. They also cause a lot of social problems because upstream, and downstream communities always fight with each other whenever a river flow is stopped by making a dam.

The mountains through which the Indus originates are tectonically one of the most active mountains of the World. These mountains have so many times recorded magnitude 8 and above Earthquakes in geological history. The dams built in such areas are a ticking time bomb and can multiply the disaster many times more. Therefore, one of the conclusions from this preamble is that building large dams is not the solution. We have to think about something which conforms to climate change, the safety of people, environmental sustainability, and the friendly relations of the upstream and downstream people. When the rivers leave the mountains, it enters the plains. Those plains are vast and have one of the most fertile soils anywhere in the World. Our old development models have cost so many problems to the plains because we use those fertile soils for irrigation and growing crops. The modern canal irrigation system has been applied here for more than 170 years and it has worked quite well for us in the beginning. But then the problem of over-irrigation, waterlogging, and salinity started coming in and with these problems, our soils got deteriorated.

In the old development models, we considered the flowing of water into rivers as a waste but now we have realized that when water is flowing into the sea it is also carrying a lot of pollutants and salts and it is cleaning our environment. Consequently, towns adjacent to

agricultural lands are drowning in salinity and waterlogging. The flowing water will also take a lot of silt with it and that silt will not only replenish the soils in the planes but would also replenish River Delta and keep a check on the seawater intrusion. All the silt is stopped in reservoirs and is diverted into the canals and does not reach the delta, as a result, River Delta is eroding. The solution to these problems is within our reach. We have very large and wide rivers running through the plains. The average width of the rivers in the active flood plains is about 6.3km and the total area of this vast riverine corridor is about 21000 sq. km. Underneath that area, there is a bed of sand which contains a minimum of 400 million acre-feet of water which is fresh, clean, and unpolluted. That water is our new source and that is where our investments priorities should be.

To utilize that water, we are now working on a concept which is called Riverine wellfield. The efficiency of water usage in the irrigation sector is very low in China and in Pakistan it is even lower. The demand for water for irrigation is very high that's why we are now developing technologies like subsurface moisture management systems which are very efficient. We are in the experimental stages and have carried out some very successful experiments in Pakistan and with this potential technology, we can save between 50-70% of the water that we are currently using. In the end, what we can do is when we talk about developing water resources, we just don't see one type of solution we suggest looking into a different type of solutions. Building dams and canals are old systems and may still be useful in some cases but then there are other systems like Aqua fair management, riverine wellfields, and soil moisture management systems. In the future, we should compare the different solutions together and follow the due diligence matrix system and then see which system is best in which area.

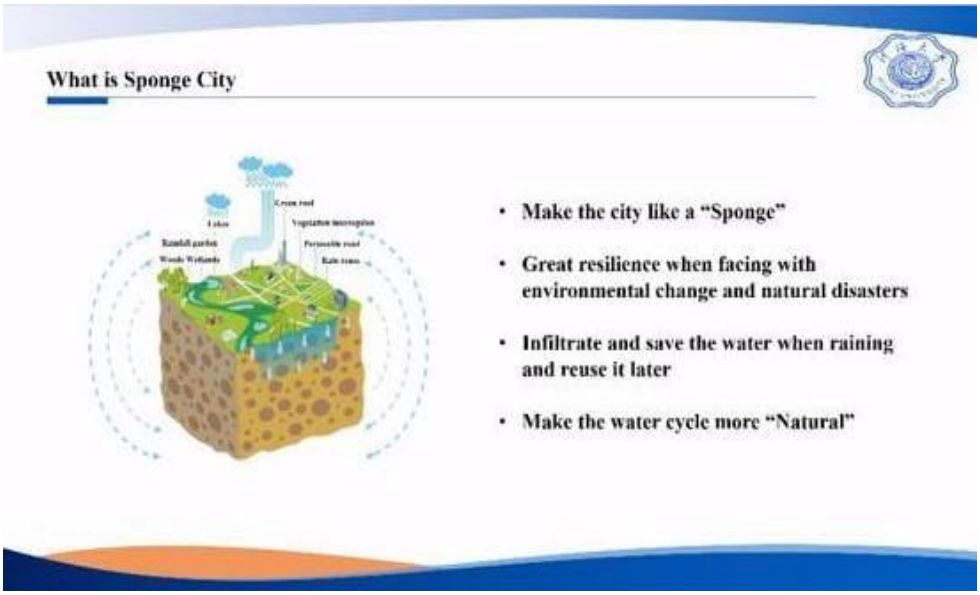


Speaker 3

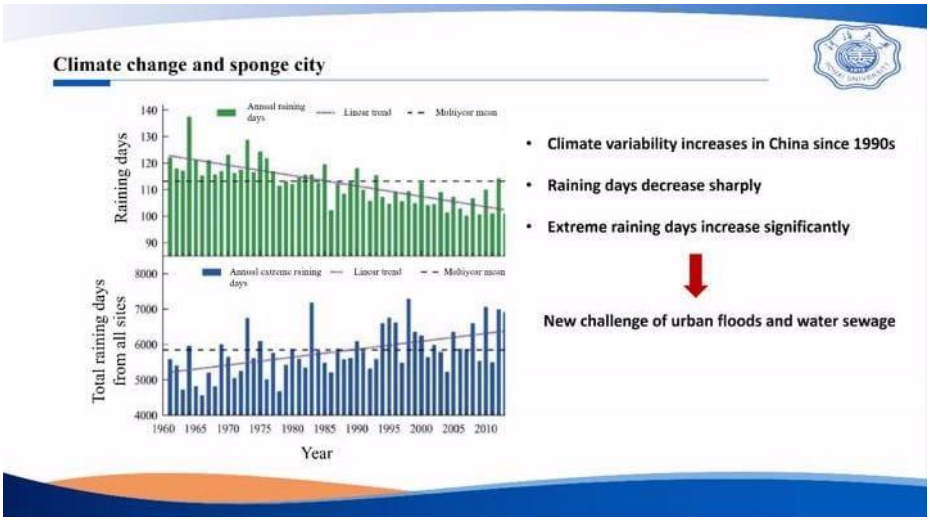
Dr. Zhu Liu – Associate Professor, Department of Hydrology and Water Resources, Hohai University, China

Topic: Sustainable Water Resource Management in China: Understanding the Concept of Sponge City

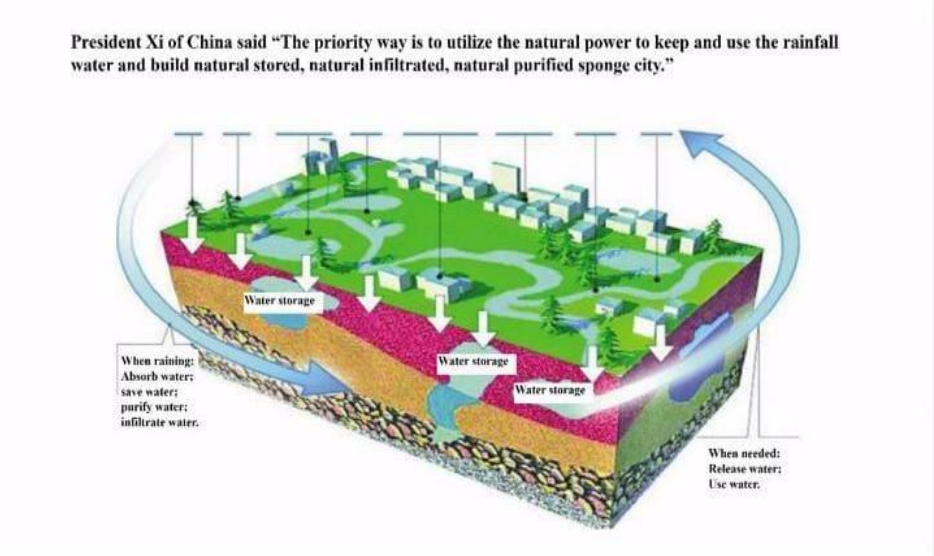
We are building a city on top of a sponge assuming the underground portion as a sponge so when the rainfall comes it can be rapidly infiltrated underground and later the water can be used. On top of the ground, we can make great infrastructures or wetlands and trees. The sponge cities should have great resilience when facing environmental changes and natural disasters and when making the water cycle more natural.



The relation between climate change and sponge cities is that in the last few decades climate had great variabilities. The rainy days have decreased sharply in the last half-century. However, comparatively, the extreme rainy days increased significantly. This means that the rainfall comes more concentrated and in a short period this brings new challenges of urban floods and water sewage systems.

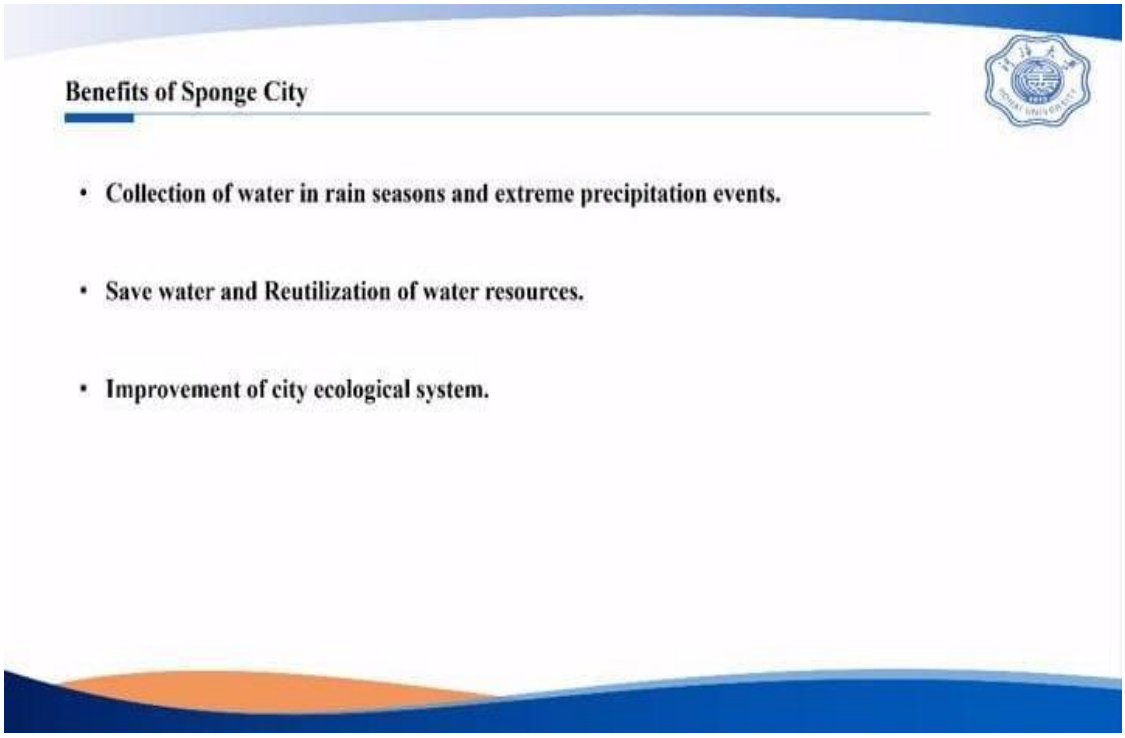


President Xi of China said that the priority way is to utilize the natural power to keep and use the rainfall water and build natural stored, natural infiltrated, and naturally purified sponge cities. Sponge city has the function to absorb water, purify and infiltrate water when needed.



The Low Impact Development (LID) shows the traditional urban development so we may use as for our comfort, which means it has very high numbers so that more flow can be transported away from urban sewage systems through pipes from the ground. This means it's not very environmentally friendly so we are making some low-impact developments to make it more natural. We mixed vegetation on top of the buildings and we used permeable materials so when rainfall comes a great portion of the precipitation will eventually infiltrate underground and the flow will increase so this way, we can lower the chance of floods.

The benefits of a sponge include the collection of water during rainy seasons and extreme precipitation events, saving water and reutilization of water resources, and improving the city's ecological systems.

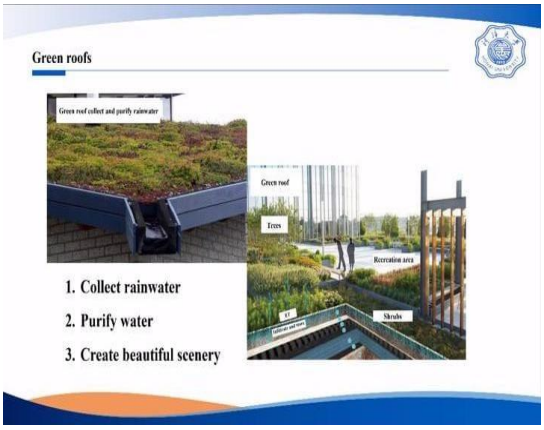


Making a sponge city includes very complex steps and many components. I have summarized three major components, i.e., water collection facilities, water storage facilities, and water usage facilities. First, we need to collect the water and there are many different types to do it.

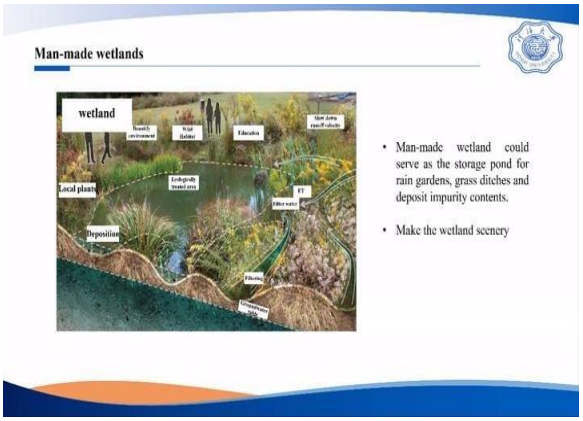
Rainfall garden is one of them. On top there is a vegetation layer then the coverage layer and soil layers. The coverage layer keeps the soil below it from flushing away during the rain.

Another type is permeable roads, the materials of concrete are permeable so can infiltrate a great portion of rainfall. Green roofs are another type of water collection facility. When we

put soils and vegetation on top of the roof it cleans the environment and absorbs the carbon dioxide and it can make the scenery look more beautiful. Collecting the rainwater also has the function to purify the water and after that, it can be transported through slopes or some other types of water transport canals to other places.



Rain barrels are one type of water storage facility. It captures water from a roof and builds it for later use such as in lawns, gardens, or indoor plants. It's a great way to conserve water and its free water to use in landscapes. Man-made wetlands could serve as the storage pond for rain gardens, grass ditches, and deposit impurity contents and it makes the wetland scenery so it is a great place to store water.



An underground tank is another type of water collection facility and it's especially used in densely populated areas where there cannot be too many wetlands or barrels to save water.

After we collect and store water we can use it later for street cleaning, lawn irrigation, concrete mixing, scenery usage, car washing, and toilet flushing.

An example of well-built sponge cities in China is green roofs in universities with permeable roads and barrels and pipes for residential areas.

Green roofs

China

Rain water collection barrels and pipes

In Germany, there are triangular slopes so that the water can't be gathered in one place. Singapore is close to the coastal regions and there are specially designed areas to collect and use water.

Germany

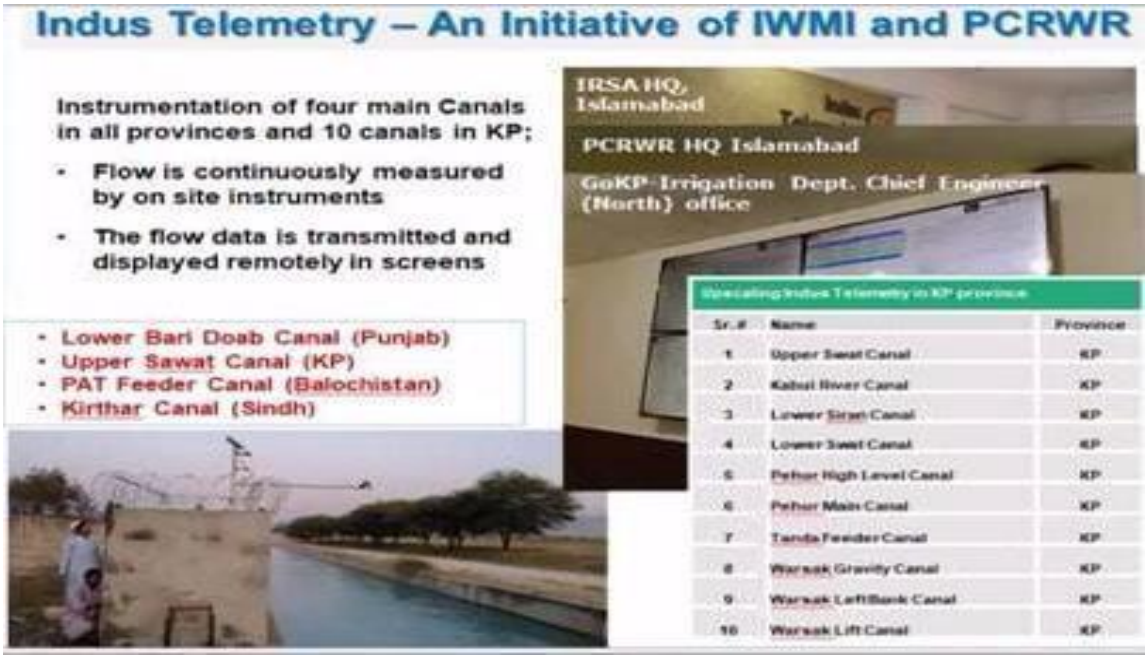
Singapore

Speaker 4

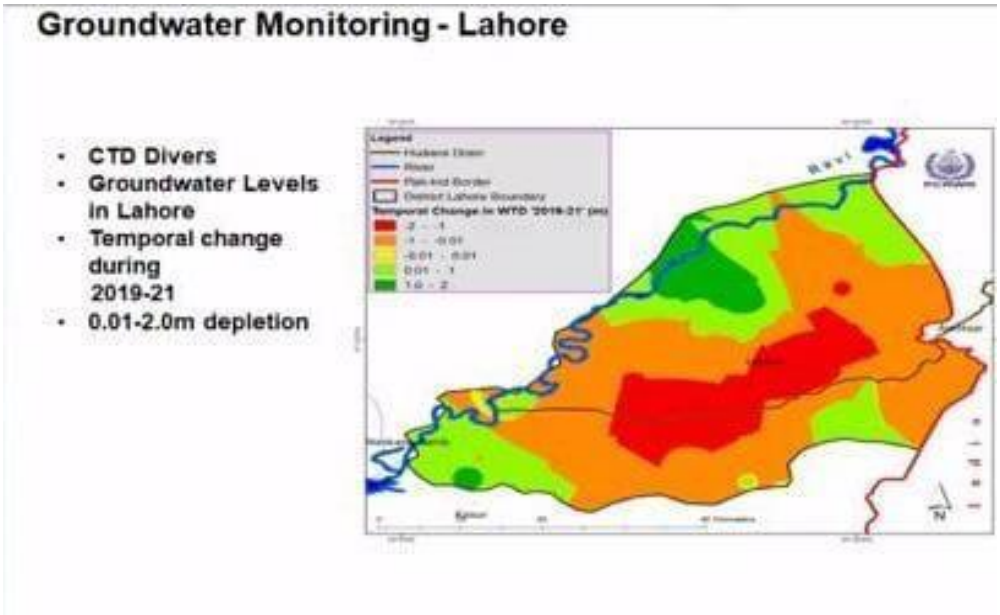
Mr. Faakhar Reza – Regional Director, Pakistan Council of Research in Water Resources (PCRWR), Regional Office, Lahore

Topic: Role in Digitizing the Agriculture and Water Management

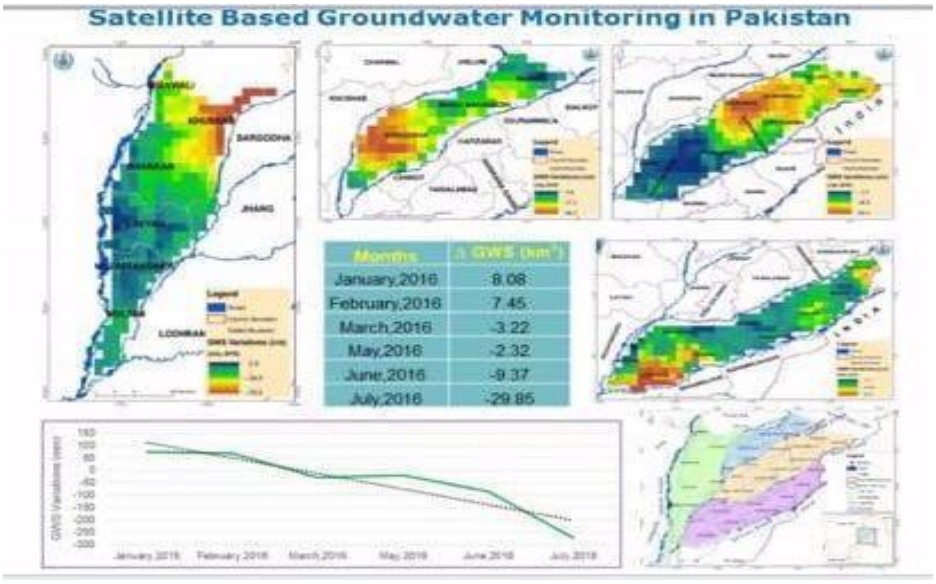
Indus Telemetry system, which we along with another water management institute have instrumented canals in all four provinces in Pakistan. We have instrumented some 10 canals in KPK, 4 canals in Sindh, 1 in Sindh, and 1 in Baluchistan where we do flow measurement and display it in all the relevant Government offices like IRSA, WAPDA, Irrigation departments, and in our headquarters, PCRWR. All the concerned departments are taken on board for trust-building. Initially, it was initiated because of mistrust between provinces about what flows are coming to which province. We do continuous flow measurement and display the real-time telemetry system and because of this initiative, we have observed that trust issues are now resolved in provinces.



We have more than 100 piezometers in Lahore in 6 districts and we have installed CTD divers we get real-time data from them and do groundwater monitoring. With CDA we are going to install 40 CTD divers for groundwater monitoring in Islamabad. Between 2019 and 2021, the groundwater level near the urban center is Lahore is growing and in some areas near River Ravi there is recharge, although that area is not too much mostly it is depleting.

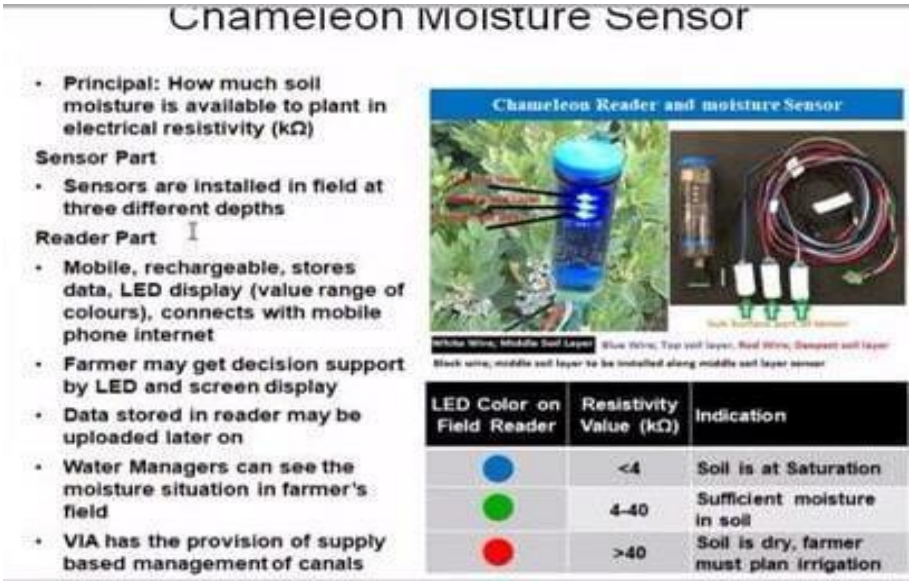


Then, we have a project regarding satellite-based groundwater monitoring and we along with the University of Washington and NASA water used this grace data and processed groundwater monitoring in Pakistan and throughout the Indus basin. An example in which we can see how this storage is changing in different months of the year 2016. Between 2003 and 2009 the groundwater storage decreased but when we had a flood in 2010, we had recharge and the storage increased



Regarding the irrigation scheduling in the irrigation sector, we have introduced some state-of-the-art equipment like the Chameleon Moisture sensor which was developed in Australia and we partnered with them for its introduction in our country. The principle of this

moisture sensor is based on measuring the available water through electrical resistivity. It has three sensors installed at different depths so that we can see at what depth what soil moisture is available. It has light-emitting diodes in different colors as well.

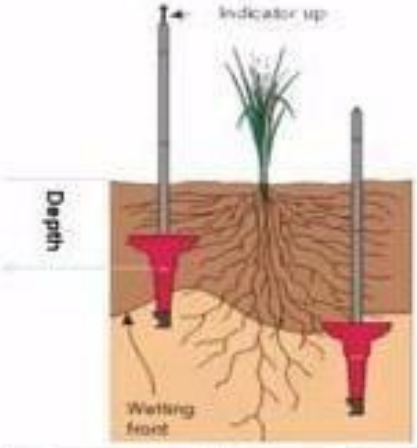


Another instrument, Fullstop (wetting front detector) detects how the wetting front is being created and two sensors are installed at different depths. The first one indicates when the soil is partially saturated it has a different color and the second one is buried according to the root depth of the plant. When irrigation water reaches that level then it pops up that we should stop the irrigation so that we don't lose the nutrients and fertilizers.

Fullstop (Wetting Front Detector)

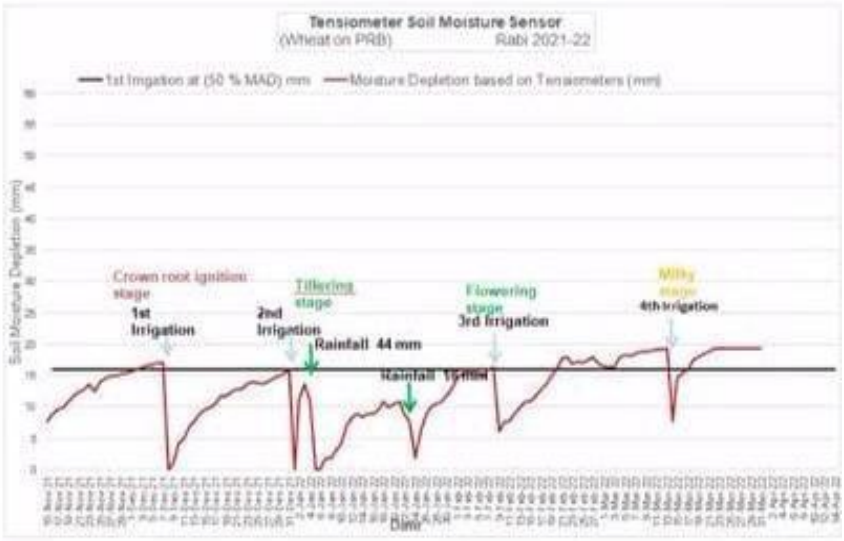
- When irrigation is applied in a field, it also dissolved nutrients available in the soil. This solution moves down into rootzone creating a wetting front
- FULLSTOP pair installed bracing the rootzone to capture this wetting front, filtered through a sand column into its reservoir;
  - Fullstop with yellow indicator installed shallow
  - Fulltop with red indicator is installed deep
- Once the sample is collected in the reservoir, magnetically latched indicator tip pops up
- Sample is sucked out using a syringe (50 ml)
- Collected sample may than be tested using nitrate strips, EC meter in field
- For any other nutrient laboratory test may be performed

VIA Tools | VIA

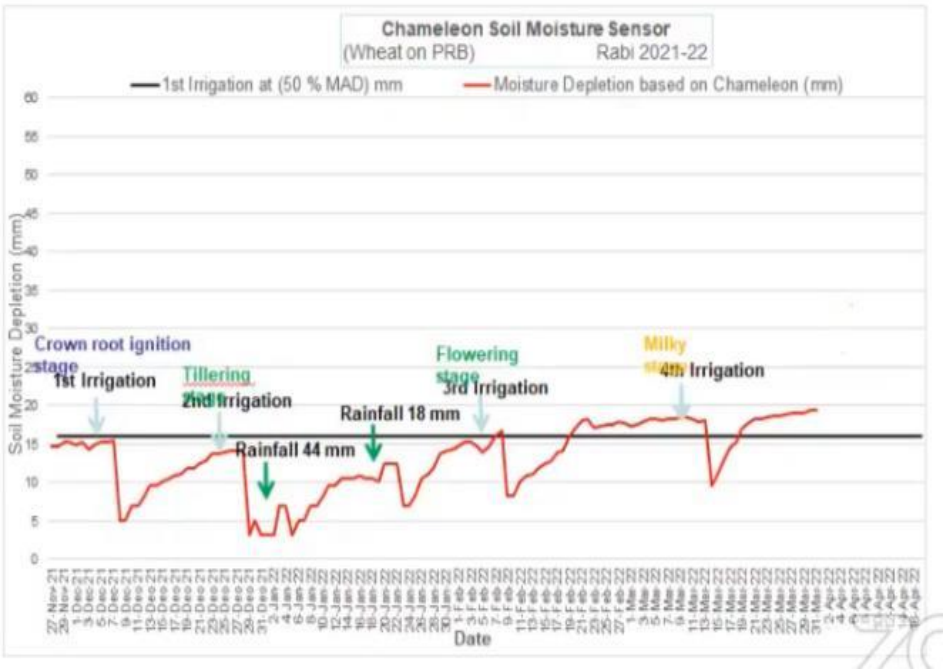


Another instrument is **Tensiometer** and which tells when the moisture is depleting and also helps us to schedule our irrigation. This year in the wheat season we know what irrigation we have done.

Irrigation Scheduling (Wheat):Tensiometer



Irrigation Scheduling (Wheat): Chameleon Sensor



Because of the technologies which we have till now developed or introduced based on that data we also do **ICT-based irrigation advisory service** to the farmers that how much is the vapor transportation in their area, the coefficient of crop and our algorithm calculate on irrigation they need in their area. We have a **tile drainage technology** to reclaim our farmlands. In areas where we have waterlogging issues, we can use this technology to drain the water for land reclamation. We have inverted wells to recharge groundwater and it is a quite useful technology to replenish our depleting aquifers. Then we have some rainwater harvesting ponds in the cholistan desert, we have hydraulic ramp pumps and cultivation on water conservation techniques and we have experimented this on rice, wheat, and banana. For drip irrigation operating on low pressure, we have experimented with skimming wells, water bird for automatic switching, safe water filter for domestic level, an arsenic kit to measure arsenic contamination in water and we have developed save water sachets and tablets for water tanks in domestic and household levels.

We have some ongoing knowledge partnerships with some renowned international organizations like SIR, UNESCO, IWMI, FAO, Asian foundation, and World Bank and we have done a lot of work with them our research work is also communicated and shared with provincial stakeholders and decision-makers throughout the country for better taking up research work to the field level.

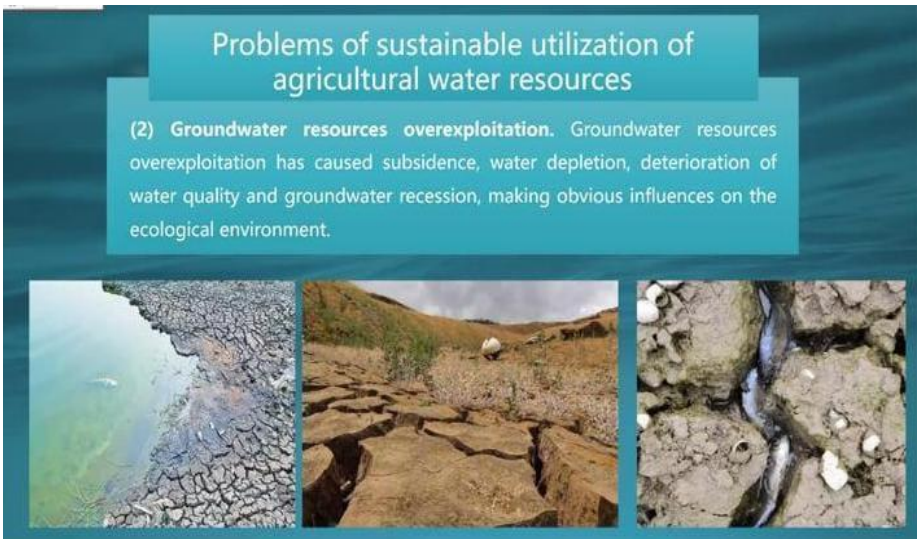
Speaker 5

Dr. Zhong-Kai Feng - Professor, College of Hydrology and Water Resources, Hohai University, China

Topic: China's Agriculture and water policy reforms: How China can assist Pakistan?

My presentation is based on four sections. The first one is the sustainable utilization problems of agricultural water resources. The second one is about the countermeasures of agricultural water resources, the third one is about the current situation of water resources in China, and finally the reform policies of water resources.

As we know, in China, the contradiction between the supply and demand of water resources in recent years grew as the economy developed rapidly. Water resources are limited so that's why there are contradictions and the shortage of water has seriously affected the food safety and agricultural economy. The groundwater resources overexploitation has caused many problems e.g., land is dried out, deterioration of water quality making obvious influences on the ecological environment.

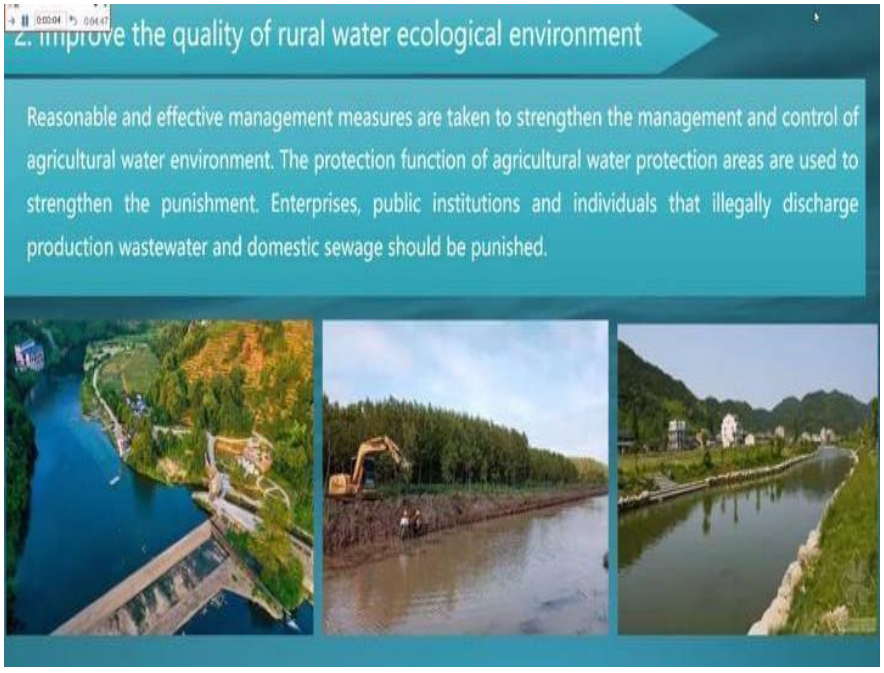


Traditionally, due to a lack of scientific agricultural irrigation systems and effective irrigation management and allocation, Low utilization of agricultural water and water resources is serious and because of that, there is low utilization efficiency of agricultural water.

Generally, many effective measures have been taken to promote governance ability in recent years. E.g., the utilization efficiency improvement of agricultural water, water-saving awareness, and new countryside construction.

The first matter is to increase the protection and conservation of agricultural water resources- Efficient water-saving engineering and high-standard farmlands are built with wastewater treatment technology.

The second is to improve the quality of the rural water ecological environment- Reasonable and effective management measures are taken to strengthen the management and control of the agricultural water environment.

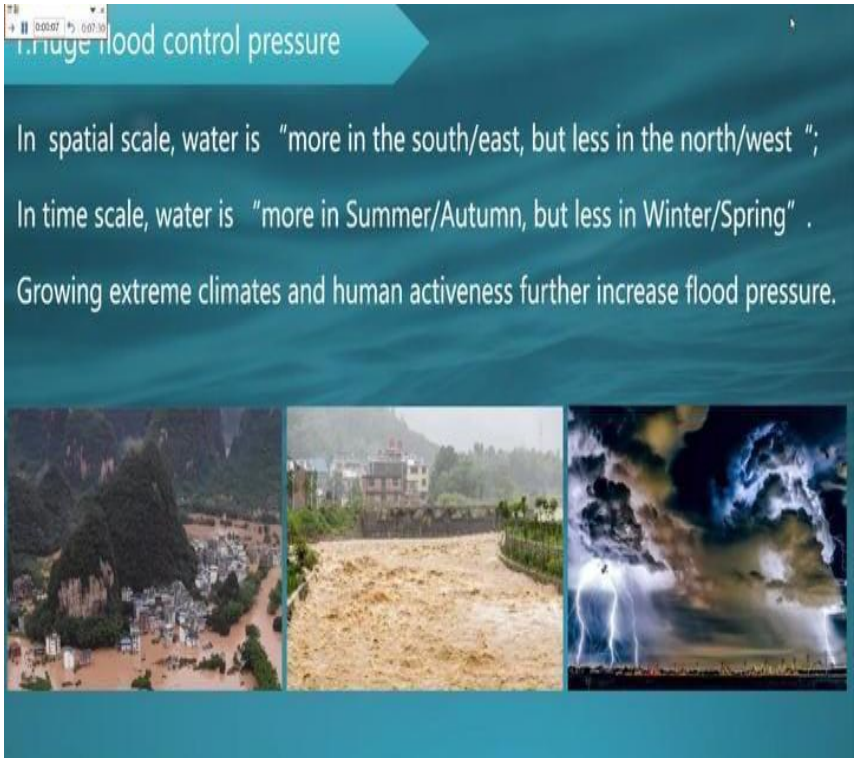


The third one is to optimize rural domestic sewage treatment and recover technology- advanced technology is used to improve the quality of agricultural water resources system.

Fourth is to strengthen efficient water-saving and improve the utilization rate- traditional methods are improved by drip irrigation, sprinkler irrigation, low-pressure tube filling, and micro-spray irrigation.

The fifth one is to improve water-saving awareness and the legal system- the water resources management rules and regulations, laws, regulations, and policies are gradually improved.

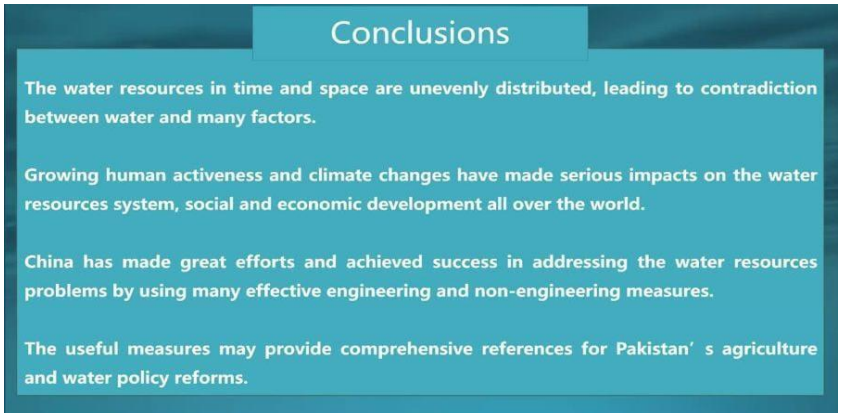
By far, the current situation of water resources in China on the spatial scale is more in the south/east, but less in the north/west. On a time, scale it is more in summer/autumn, and less in winter/simmer. Growing extreme climates and human activeness further increase flood pressure. There are serious contradictions between water supply and demand because of low per capita water resources and their utilization rate. Water loss and soil erosion due to overexploited land resources and destroyed ground vegetation. Water pollution includes industrial wastewater, domestic sewage, and agricultural drainage.



The reform policies include the most stringent water resources management regime includes two aspects. **Three red lines**: First- is the red line for the development and utilization of water resources. Second- red line for controlling water use efficiency. Third- red line for limiting pollutants intake in water functional areas. **Four Systems**: total water

consumption control, water efficiency control system, water function areas that restrict the sewage collection system, and water resources management responsibility and assessment system.

The water resources in time and space are unevenly distributed leading to the contradiction between water and many factors. Growing human activeness and climate changes have made serious impacts on the water resources system and social and economic development around the world. China has made great efforts and achieved success in addressing the water resources problems by using effective engineering and non-engineering measures. The useful measures may provide a comprehensive reference for Pakistan's agriculture and water policy reforms.



MEDIA COVERAGE

The News

https://www.thenews.com.pk/print/950414-experts-discuss-challenges-in-water-governance

The Nation

https://nation.com.pk/2022/04/15/pak-china-experts-discuss-practical-challenges-in-water-governance/

Daily Express News: (Urdu)

https://www.express.com.pk/epaper/PoPupwindow.aspx?newsID=1109177752&Issue=NP_ISB&Date=20220415

Roznama Dunya: (Urdu)

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Pak-China experts discuss practical challenges in water governance

INP

ISLAMABAD—Experts from Pakistan and China at an online International conference discussed practical challenges in water governance for their respective countries.

The conference was organized by Pakistan Research Center for a Community with Shared Future on 12th April 2022.

According to a Gwadar Pro's report, it was aimed at providing a premier interdisciplinary platform for relevant stakeholders and experts to discuss the most recent innovations, trends, and practical challenges in water governance in Pakistan and China.

Maryam Raza, Deputy Director, Pakistan Research Center for a Community with Shared Future in her opening remarks highlighted that the conference theme holds a lot of significance in this period as rapid population growth, fast urbanization, increasing economic development, and climate change have led to a global water supply crisis.

She said, "it is important to learn from our neighboring countries like China about their achievements in water governance and related sectors."

Prof. Youwei Qin, Associate Professor, Hohai University, Nanjing, China mentioned that due to the impact of climate change, Pakistan and China are at risk of droughts, floods, etc. It is difficult to deal with flood problems of rivers that are in the residential areas with a huge population.

Dr. Zhong-kai Feng, Professor of College of Hydrology and Water Resources, Hohai University, Nanjing, China mentioned that China has made great efforts and achieved success in addressing water resources problems by using many effective engineering measures.

He was of the view that the useful measures may provide comprehensive references for Pakistan's agricultural and water policy reforms as well.

Daily Ausaf: (Urdu)

موسمیاتی تبدیلیاں، پاکستان و چین کو خشک سالی کا خطرہ لاحق

اسلام آباد (نیوز ایجنسی) چینی سکالرز نے کہا ہے کہ موسمیاتی تبدیلیوں کے اثرات کی وجہ سے پاکستان اور چین خشک سالی کے خطرے سے دوچار ہیں، گنجان آباد علاقوں میں سیلاب کے مسائل سے نمٹنا مشکل ہے، چین نے آبی وسائل کے مسائل کو حل کرنے میں بڑی کوششیں کی ہیں مفید اقدامات پاکستان کی زرعی اور آبی پالیسی میں اصلاحات کیلئے بھی جامع حوالہ جات فراہم کر سکتے ہیں۔ گوادر پرو کے مطابق پاکستان ریسرچ سینٹر فار اے کمیونٹی وِد شیئرڈ فیوچر کے زیر اہتمام ایک آن لائن بین الاقوامی کانفرنس بعنوان واٹر گورننس اور اشتراکی حکمت عملیوں کو سمجھنا، مشترکہ چیلنجز کیلئے حل تلاش کرنا کا انعقاد 12 اپریل 2022 کو کیا گیا۔ کانفرنس کا مقصد متعلقہ اسٹیک ہولڈرز اور ماہرین کو پاکستان اور چین میں واٹر گورننس میں حالیہ اختراعات، رجحانات اور عملی چیلنجز پر بات کرنے کیلئے ایک علمی بین الضابطہ پلیٹ فارم مہیا کرنا تھا۔ گوادر پرو کے مطابق پاکستان ریسرچ سینٹر فار اے کمیونٹی وِد شیئرڈ فیوچر کی ڈپٹی ڈائریکٹر مریم رضا نے اپنے افتتاحی کلمات میں روشنی ڈالی کہ کانفرنس کا تھیم اس دور میں بہت اہمیت رکھتا ہے کیونکہ آبادی میں تیزی سے اضافہ، تیزی سے شہر کاری، اقتصادی ترقی کا فروغ اور موسمیاتی تبدیلیوں نے پانی کی فراہمی کے سائیکل کو ان جنم دیا۔ انہوں نے کہا ہمارے پڑوسی ممالک جیسے چین سے آبی حکمرانی اور متعلقہ شعبوں میں ان کی کامیابیوں کے بارے میں سیکھنا ضروری ہے۔