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# Proposal under China - Europe Water Platform Challenge

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Hydropower Research**



## About IWHR

- ▶ **China Institute of Water Resources and Hydropower Research (IWHR) is the largest comprehensive research institute at the top level in the field of water resources and hydroelectric power in China. At present, IWHR has over 1411 staff members, 12 research departments and 32 laboratories.**
- ▶ **IWHR has built a professionally excellent team with 2 academicians of Chinese Academy of Sciences and 5 academicians of Chinese Academy of Engineering, currently possesses 120 senior engineers at professor level and 329 senior engineers.**







## About IWHR——Field of research

- water resources management
- water environment protection
- flood control and drought relief
- river regulation and inter-basin water transfer
- sedimentation in rivers and reservoirs
- structural optimization
- earthquake resistant analysis
- complex foundations treatment
- hydro-electric equipment testing and checking
- power plant automation
- safety monitoring
- construction materials design and control
- new technology for concrete faced rock-fill dam and roller compacted concrete dams
- hydro-turbine sets and rehabilitations
- cooling water study,
- fly ash deposit, etc.



## About IWHR

- ▶ **Over the years, IWHR has completed many research and consultancy tasks for hundreds of key projects in China.**
- ▶ **IWHR has continuously provided technological support to the government for important macroscopic decision making on flood management, rational water resources allocation, water-saving society building, aquatic-eco-environment protection, drinking water safety, environment-friendly hydro-power projects, etc.**
- ▶ **IWHR has won many national and ministerial awards for progress in science and technology. IWHR has also won a number of National Awards for Natural Sciences and National Awards for Invention.**



# PROPOSALS

- ▶ **1. Strategic research in the area of integrated responses for droughts and floods in China**
- ▶ **2. Risk assessment and adaptation strategy of flooding and water-logging disasters in urban area**
- ▶ **3. Cooperation Study of Small Hydropower Substituting Fuel in Response to Climate Change in China**
- ▶ **4. Dike safety assessment guideline**
- ▶ **5. Synergy of satellite imagery and altimetry for inland water bodies and wetland monitoring in the middle and lower reaches of the Yangtze River**
- ▶ **6. Platform construction of reservoir joint regulation in the Yangtze River Basin**



# 1. Strategic research in the area of integrated responses for droughts and floods in China

## Introduction

**Under the influence of climate change, the characteristics of droughts and floods experience profound changes in term of severity, frequency, duration, spatial distribution, etc.**

**Climate change posed a new challenge to drought and flood research as (1) it changes the pattern of occurrence and formation mechanisms of such disasters, (2) it requires us to re-evaluate the current disaster early warning, evaluation and assessment system, and (3) it challenges the current strategic integrated disaster response system.**

# 1. Strategic research in the area of integrated responses for droughts and floods in China

## Objectives

- (1) National drought and flood disaster mitigation strategy: the main problems to be tackled include agricultural droughts, urban flooding, water quality and eco-system, early warning and monitoring capability, etc;
- (2) National drought and flood disaster integrated response strategy: this includes the interrelationship between droughts and floods, and how the responses to cater for both types of disaster;
- (3) Drought and flood disaster response strategy for main disaster regions: the main disaster areas are Northeast, North China plains, Fen-wei plains, Huai river, and Dongting lake catchment and Southwest region.

## **2. Risk assessment and adaptation strategy of flooding and water-logging disasters in urban area**

### **Introduction**

Under the background of global climate change, extreme rainfall events happen frequently and have concentrated distribution in space. The generation, evolution and development regularities of flooding and water-logging disasters in urban area changed greatly than before. China is at a stage of rapid urbanization development currently, more and more population, assets and wealth are concentrated in cities. The vulnerability of all kinds of assets is increasing gradually. Once flooding and water-logging disasters happened, more economic losses and social impacts would be brought to cities.



## 2. Risk assessment and adaptation strategy of flooding and water-logging disasters in urban area

### Objectives

Focusing on flooding and water-logging disasters in urban area, this project will analyze the research and application achievements of other countries and take them for our reference in the aspects of flooding and water-logging disasters risk assessment, flood control and drainage adaptation strategies addressing climate change, decrease the vulnerability, etc., as well as communicate the experiences of flooding and water-logging disaster emergency management at home and abroad, based on the existing projects and by the form of staff exchange and visits, etc.

### **3. Cooperation Study of Small Hydropower Substituting Fuel in Response to Climate Change in China**

#### **Introduction**

**Small Hydropower Substituting Fuel (SHSF) project, falling into many fields such as energy and environment, has comprehensive benefits among responding to climate change, energy saving and emission reduction, poverty alleviation and ecological protection, which has currently become a leading topic for the Chinese Government and international community. From 2009 to 2015, totally 1022 SHSF hydropower stations will be built in 21 provinces with the total installed capacity of 1705.6 MW. The cooperation project will also play important roles to enlarge the benefits of SHSF, promote the sustainable and healthy development of rural hydropower, and reduce GHG emissions.**

### 3. Cooperation Study of Small Hydropower Substituting Fuel in Response to Climate Change in China

#### Objectives

The study includes on-site monitoring and data collection. With the upcoming launch of Carbon Satellites, around the topic of Small Hydropower Substituting Fuel in response to climate change, water resources and ecological protection, we will build the long-term monitoring base of greenhouse gas emissions (GHG) from Reservoirs and Conversion of Cropland to Forest, build the development platform of Program Clean Development Mechanism (P-CDM). In order to ensure the smooth progress of the project, China and Germany will do the technical exchange, training and cooperative research by exchanging the personnel. The research are to learn monitoring equipment design, processing and transformation, to learn Carbon Satellites receiving, to learn use, installation, maintenance, data processing and modeling of the water resources monitoring equipment.



## 4. Dike safety assessment guideline

### Introduction

**In China, more than 290,000km dike of different grade have been built for flood control. However their safety condition has never been systematically assessed. Some of them have internal deficiencies that threaten their safety. Emergent situation occurred frequently in flood season. To prevent potential dike failure events, systematic and periodical safety assessment is needed following a general guideline.**

## 4. Dike safety assessment guideline

### Objectives

**This project will work out a guideline for the safety assessment of existing dike that may have different types of deficiencies. It will be used for the daily safety management of river dike and coastal dike system. This project can be a multi-country cooperation program that may involve the Netherlands, UK, French and USA, etc. At present, China Institute of Water Resources and Hydropower Research has been cooperating with Deltra of the Netherlands on the study of dike foundation piping mechanism and its prevention methodologies. This could be the basis for further cooperation with European countries.**

# 5. Synergy of satellite imagery and altimetry for inland water bodies and wetland monitoring in the middle and lower reaches of the Yangtze River

## Introduction

As one kind of natural water resources, the lakes play an extremely vital role to humanity's production and life. Therefore, under the background of joint influences from current global climate change and human activity, to strengthen the hydrology and ecology change research in large lake area has a great and practical significance. New technology is such as remote sensing is necessary in current monitor of hydrological and ecological changes in lake areas.



# 5. Synergy of satellite imagery and altimetry for inland water bodies and wetland monitoring in the middle and lower reaches of the Yangtze River

## Objectives

The project selects the Poyang lake and Dongting Lake as the study area, and takes the way of “data introduction - method development - change monitoring - driven analysis” to monitor hydrological and ecological changes in lake areas. (1) New remote sensing data and the development of information extraction methods. (2) Short period and long time series' remote sensing monitor in the Poyang and Dongting Lake area, to get a clear understanding of what is the driving mechanism for recent years' hydrological and ecological changes. (3) Essential information support and the policy-making basis for the mechanism research of basin flood/drought disaster.

# 6. Platform construction of reservoir joint regulation in the Yangtze River Basin

## Strategic needs

- (1) Key research on space and time matching scale and driving mechanism of atmosphere mode and hydrological model, to establish the distributed land-atmosphere coupling model with physical mechanism, to breakthrough the restriction of rainfall and runoff forecast, improve the accuracy of long-term runoff forecast.
- (2) Key research on the theory and method to describe the boundary of hydrology, ecology and hydropower to support large-scale reservoir regulation.

## 6. Platform construction of reservoir joint regulation in the Yangtze River Basin

### Strategic needs

(3) Key research on figure out the order of reservoirs storage and drain water both after flood period and in dry period in the Yangtze river basin, and to assess the risks and quantitative analysis technology of reservoirs joint regulation under the influence of uncertain factors.

(4) Key research on a major engineering demand of giant type reservoir group which is multi-objective equalization , the main difficulty is how to build a multi-objective optimization equilibrium model of reservoir group that can coordinate different conflicts of scheduling goal competition , and conquer high dimension multi-scale problem the model faced.



## 6. Platform construction of reservoir joint regulation in the Yangtze River Basin

### Strategic needs

(5) Key research mass on multiple source database integration methods, service-oriented loose coupling multiple model system integration mechanism, based on cloud computing integrated platform of the parallel optimization technique, standardization model representation method, distributed multi-mode in consultation with the construction of the decision-making system.



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# Thank You!

