Current Ongoing Research Projects of Supervisors in IWHR

(for Both Master's and Doctoral Degree Candidates)

No.	Program	Supervisor	Degree Type	Project and its introduction	Student Requirement	Duration	Contacts
1	Geotechnical Engineering	CHEN Zuyu	PhD	**1. Intelligentization of TBM construction using deep learning method** During tunnel boring machine (TBM) construction, complex geological environments may be encountered, and TBM malfunctions such as jamming may occur, while geological hazards such as rock bursts and collapses may occur in the tunnel. Microseismic monitoring instruments and TBM equipment record a large amount of construction process parameters and information, which are crucial for geological hazard forecasting and TBM construction. This project uses big data and deep learning methods to establish a TBM database, develop deep learning models, and explore intelligent forecasting of geological hazards such as rock bursts, as well as research on intelligent TBM construction in tunnels.	1) MSc in Geotechnical engineering, Civil Engineering, Mechanics, or related areas; 2) Modelling experience and programming skills, preferably in Python, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-31-2027	wangyj@iwhr.com
				2. Liquefaction mechanism of deep-seated liquefiable soils based on centrifuge model experiments This project uses large-scale geotechnical centrifuge and vibration table equipment from the Water Conservancy Institute to conduct dynamic centrifuge model tests for different cover layer thicknesses, liquefiable soil layer thicknesses, and earthquake intensities. The aim is to test the distribution of the stress field, pore water pressure, and seismic acceleration response along the depth, analyze the influence of the overlying soil layer thickness on the seismic effect, liquefaction resistance, and liquefaction potential, evaluate the limitations and applicability of the liquefaction identification criteria, establish a calculation method for the seismic effect and liquefaction resistance of deep cover layers, reveal the mechanism and triggering mechanism of deep soil liquefaction, and form a method for judging deep liquefaction.		As from now to 12-31-2026	hujing@iwhr.com
2	Geotechnical Engineering	WANY Yujie	PhD,MSc	**1. Research on limestone stratum identification, groutability and grouting quality evaluation based on digital drilling technology** To establish the machine-rock perception relationship of digital drilling in fractured rock mass of limestone stratum, develop the automatic processing program of drilling response data and the three-dimensional display software of stratum information, propose the software and hardware equipment and technology of limestone grouting stratum recognition based on digital drilling, and propose a comprehensive evaluation method for the groutability of limestone stratum based on combined drilling and geophysical methods such as digital drilling, water pressure test, borehole acoustic detection, borehole TV and cross-hole CT technology, and establish a new index for quantitative evaluation of grouting quality and evaluate the grouting quality continuously, in real time, in situ and quantitatively.	1) BSc / MSc in Civil Engineering, Geotechnical Engineering, or related areas; 2) Modelling experience and programming skills, preferably in Flac3D or Python, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-30-2027	wangyj@iwhr.com
				2. Evaluation of permeability characteristics and grouting effect of Xiyu conglomerate To put forward the determination method of Xiyu conglomerate characteristics and engineering physical and mechanical parameters, establish the analysis method and treatment measures of deformation and instability of Xiyu conglomerate slope, and propose the key technology of dam construction with Xiyu conglomerate.		As from now to 12-30-2027	wangyj@iwhr.com
3				**1. Rockfill dam engineering: numerical analysis** By employing numerical analysis method, study the stress and deformation properties and stability of high rockfill dams.	1) BSc / MSc (for mater degree student) or MSc (for doctor degree student) in geotechnical engineering, engineering geology, civil engineering, or related areas. 2) Sound knowledge on soil mechanics, hydraulic structures,	For master degree student, from now to 12-30-2024	xuzp@iwhr.com

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3	Geotechnical Engineering	XU Zeping	PhD	**2. Rockfill dam engineering: physical modeling** By using the large scale centrifuge to study the performance and failure mode of rockfill dams.	modelling experience and programming skills, preferably with the experience of using ABAQUS, ANASYS software, proven by previous studies and works. 3) Fluent spoken and written English	For doctor degree student, from now to 12-30-2027	xuzp@iwhr.com
4	Geotechnical Engineering	DENG Gang	PhD,MSc	**1. Analysis of Embankment Dams** Analysis and prediction of the behavior of embankment dam and other structures. Risk analysis.	1) BSc / MSc in Hydraulic Engineering, Civil Engineering, Geotechnical Engineering, or related areas; 2) Finite Element Modelling experience and programming skills, proven by previous studies and work; 3)Excellent spoken and written English.	As from now to 12-30-2027	dgang@iwhr.com
				2. Engineering Property of Embankment Dam Filling Materials Test and analysis of mechanical properties of embankment dam filling materials, such as rockfill.	1) BSc / MSc in Hydraulic Engineering, Civil Engineering, Geotechnical Engineering, or related areas; 2) Laboratory test experience; 3) Excellent spoken and written English.	As from now to 12-30-2027	dgang@iwhr.com
5	Hydrology and Water Resources	WANG Hao	PhD	**Water resources evolution and adaptation utilization** This project belongs to the Second Qinghai-Tibet Plateau Scientific Investigation and Research Program (STEP). The project holds two major aims. One is to reveal the spatio-temporal variations of water resources and the impacts on water supply and hydropower development in the Qinghai-Tibet Plateau (QTP) under changing environment. The other one is to propose adaptation strategy on water resources utilization in the perspective of water security, energy security and eco-environmental security. In the study, multi-sources monitoring technologies, multi-model simulation and whole-processes assessment of hydrological cycle and water resources evolution have been applied. Particularly, sufficient in-situ field investigation on water resources distribution and variations should also be undertaken. The outputs of the project could provide a wide range of investigation reports, field observation data and digital materials, consulting reports on water resources variations and adaptation strategies in the QTP.		2019-2026	wanghao@iwhr.com

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6	Hydrology and Water Resources; Water Disaster and Security	WANG Yicheng	PhD,MSc	**Quantitative storm-flood forecasting by a two-way interactive coupling of the atmospheric and land-surface hydrologic processes** This project is funded by the National Natural Science Foundation of China (NSFC). It aims at improving the forecast skills of storms and floods by considering the two-way interactions between the atmospheric and land-surface hydrologic processes. The main tasks include: (1) Diagnose the driving factors, occurrence laws and evolutional patterns of historical storms and floods under the impact of urban development and climate change; (2) Develop a physically-based land-surface hydrologic model that considers the interactions between the atmospheric and land-surface hydrologic processes; (3) Realize a two-way coupling of the land-surface hydrologic model with a numerical weather prediction (NWP) model for on-line interactive forecasting of storms and floods; and (4) Enhance the forecast skills of the coupled system by assimilating “air-space-ground” multi-source observations with the assistance of artificial intelligence techniques (i.e., deep learning models).	1) MSc in Civil Engineering, Environment Engineering, Earth Sciences or related areas; 2) Modelling experience and programming skills, preferably in the field of hydrology and water resources, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-31-2027	wangych@iwhr.com; 179070319@qq.com
7	Hydrology and Water Resources	YAN Denghua	PhD	**1. Extrapolation of hydrological-ecological-sediment process scenarios and adaptive regulation in the Yangtze and Yellow River source areas in the context of climate change** The source area of the Yangtze River and the Yellow River is a key area of the "Chinese Water Tower" and the ecological barrier of the Qinghai-Tibet Plateau, and is of strategic importance. In practice, there is an urgent need to answer the question: What changes have taken place and will take place? What are the implications? How can we proactively adapt and respond scientifically? The overall objectives of this project are: to breakthrough in the simulation of key elemental processes under energy and water phase changes, and to quantify the mechanism of CHESP feedbacks over the past 60 years; to develop a holographic and accurate scenario projection platform that couples numerical simulation and knowledge mining to project the future changes over 60 years, and to become the core engine of the digital twin basins of the Yangtze and Yellow River source area; to develop a baseline for adaptation and regulation; and to develop a platform for the identification of the threshold for adaptation and regulation and the development of a digital twin basin. Threshold identification and adaptive regulation techniques for soil and water resources, and propose regulation schemes and technology lists.	1) professional requirements: hydrology and water resources, ecology, etc. 2) Proficiency in programming languages such as fortran and Python, and in the use of ArcGIS and hydrological models	As from now to 10-2025	yandh@iwhr.com
				2. Watershed water system regulation based on water yield and consumption characteristics of slope units This project mainly focuses on the core research direction of "evolution and regulation of watershed water system" set in the field of "water safety and engineering guarantee". Based on a large number of preparatory works, this project integrates the comprehensive advantages of prototype observation, control experiment, numerical simulation, big data knowledge mining and geographic information technology to accurately identify the water yield and consumption characteristics of the slope unit of the watershed. By following the natural evolution law of water yield and consumption of slope unit, this project identifies the baseline and obtains its control threshold through scenario deduction analysis, a dual control model for water yield and consumption is developed by considering the mutual feedback mechanism between water and land resources, which is applied to the three typical watersheds of the Yellow River and the Huai River to propose specific construction plans and dual control implementation mechanisms.		As from now to 12-2026	

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				3. Rational allocation of water resources towards carbon neutrality and carbon peaking Carbon peaking and carbon neutrality are major strategic objectives in addressing climate change. The allocation of water resources in the new era for the dual carbon objectives is not only a key issue at the scientific level, but also a technical challenge that needs to be broken through in the fields of hydrology and water resources, water ecology protection and restoration. The project identifies the impact of typical water allocation projects on regional carbon balance based on the carbon-water coupling relationship between key water users and ecological restoration measures, and constructs a model to evaluate the allocation and effects of water resources for the dual-carbon objectives; and applies it to the Haihe River basin and the Beijing-Tianjin-Hebei region, the Yangtze River basin and the Yellow River basin to propose water resources allocation solutions for the dual-carbon objectives.		As from now to 6-2024	
8	Hydrology and Water Resources	JIA Yangwen	PhD	**Impact mechanism of soil moisture re-allocation on runoff generation in hillslopes and flash flood simulation** It is a National Natural Science Foundation of China Project, and its main tasks include: 1) quantitively depicting the soil moisture re-allocation effects to hillslope runoff-generation due to the roles of topography and soil-vegetation changes; 2) based on the multi-layer Green-Ampt infiltration model and two-dimensional saturated soil water simulation, innovatively describing the mode of variable source area and compound runoff-generation of "slope toe - slope waist - slope top", and to explore simulation methodology of hillslope hydrology and the effect of temporal-spatial scales; 3) build a distributed flash flood model based on multi-source information and physical mechanism and adopting the calculation units of mosaic land uses in contour belts in sub-basins; 4) putting forward the quantitative factors and early warning thresholds of flash flood under the combined influence of climate and landform.	1) MSc in Civil Engineering, Environmental Engineering, Hydraulic Engineering, or related areas; 2) Modelling experience and programming skills, preferably in the field of hydrology and water resources, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-31-2026	jiayw@iwhr.com
9	Hydrology and Water Resources	LIU Jiahong	PhD	**Scientific research on joint prevention and control of river flood and urban waterlogging disaster chain in megacities** 1) to integrate the river and urban meteorological-hydrological observation facilities into a collaborative one to monitor and forecast the flood risk; 2) intelligent early warning and directional message broadcasting technology for river flood and urban waterlogging disaster chain, 3) coupled simulation of river-urban flood and demonstration of joint prevention and control scenarios; 4) intelligent decision-making technology for river-urban joint flood control and emergency plan preparation.	1) MSc in Hydrology, Hydraulic Engineering, Computer science and Engineering, or related areas; 2) Modelling experience and programming skills, preferably in Python / C++, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 11-30-2025	liujh@iwhr.com
10	Hydrology and Water Resources	LEI Xiaohui	PhD,MSc	**Hydrological uncertainty and ensemble forecast** This project aims at the uncertainty of hydrological simulation and forecast results. Starting from the source, this project first studies various sources of uncertainty in hydrological simulation and forecast, and analyzes their differences in different spatial location, different time and different runoff generation process. Then, aiming at the uncertainty caused by model input, model parameters and model structure, a method to describe all kinds of uncertainty in the form of ensemble members will be developed, and the uncertainty distribution of result or result error while be described with the simulation prediction results; finally, a set of ensemble hydrological model considering multi-source uncertainty will be developed. The difference of prediction effect and uncertainty description between different models will be discussed.	1) BSc / MSc in Hydrology and Water Resources, Civil Engineering, or related areas; 2) Modelling experience and programming skills, preferably in Python/Fortran/Arcgis, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-31-2025	lxh@iwhr.com

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11	Hydrology and Water Resources	YOU Jinjun	PhD,MSc	**1. Methodology of river-basin ecological operation based on a binary framework** Aiming at the shortage of lack of relation between water exploitation and projects operation in the ecological regulation both in research and reality, a binary framework and model combining the socio-economic development and ecological demands are put forward to get effective e-flow regulation in river-basin scale. Optimization of regulation rules is performed through artificial algorithms under different targets and priorities to figure out the effective and practical operational scheme for e-flow. The regulation rule for reservoirs' operation is optimized with the maxim objectives of benefits and constraints of e-flow through various optimization algorithms, with the inflow and water supply provided by the upper layer model.	1) BSc in water resources & Hydrology; 2) Modelling experience and programming skills, modeling work in hydrology or water exploitation, proven by previous studies and work;	As from now to 12-31-2024	youjj@iwhr.com
				2. Water Allocation and High-Efficiency Water Utilization of Ningxia Hui Autonomous Region Ningxia is a province in Yellow River Basin with severe water scarcity. The major target is to develop a dynamic water allocation model for Ningxia under the constraints of available water from Yellow River and capacity of hydraulic facilities. Under the annual plan making, the monthly operation under the annual plan will be made based on the real condition and decision-making requirement. This work would be an innovation and progress based on the previous water allocation model for water planning, to support realistic regulation along with changing environment and dynamic water demands.		As from now to 12-31-2023	youjj@iwhr.com
				3. Study on water demand-supply analysis A long-term technical support project for Ministry of Water Resources. The purpose is to seek scientific and objective methodology to forecast or judge the water demand, water supply and water shortage. In the study, the factors of natural water condition, socio-economic development, water-use efficiency and capacity of hydraulic projects are all needed to be taken into consideration. Through the study, we provide technology to support feasibility analysis for large hydraulic projects, especially water diversion project.		As from now to 12-31-2025	youjj@iwhr.com
12	Hydrology and Water Resources	Long Aihua	PhD,MSc	**1. Simulation and Regulation of Water Cycle in Arid Areas** Oriented to the uncertainty of water resources under climate change in the arid northwest region, this project tries to explore suitable structure of the evolution of oases, evaluate the multi-scale ecological water demand for ecological security, research on water availability and carrying capacity. From the perspective of socio-hydrology, the purpose of this project is to reveal the evolution mechanism of "west-to-east transport" in the northwest arid inland river basin from the perspective of new water cycle, and propose socio-hydrological scenario analysis and adaptive countermeasures.	1) BSc/ MSc in Hydrology and Water Resources, Hydraulic Engineering, or related areas; 2) Hydrological modelling experience and programming skills, preferably in MIKE, Python, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 10-20-2025	ahlong@iwhr.com
				2. Investigation and evaluation of water resources utilization in the Ili River Basin This project tries to clarify the development and utilization of water and soil resources and the balance between supply and demand of water resources, evaluate carrying capacity and efficient utilization potential of water resources, in order to provide a key scientific basis for the high-quality development and long-term planning strategy of Xinjiang and the Ili River Basin in the new era. There are four main tasks in this project. First is to carry out surveys of mountain temperature, precipitation, glaciers, frozen soil and snow cover. Second is to carry out surveys on the topography and geomorphology, river runoff, water environment, water ecology and spatiotemporal changes of lake water bodies of major rivers. Third is to investigate the development of water and soil resources and socio-economic water use in the river basin, the water supply capacity of water conservancy projects. The last one is to investigate the current situation of water resources development and utilization.		As from now to 11-30-2024	ahlong@iwhr.com

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13	Hydraulics and River Dynamics	CAO Wenhong	PhD	**1. Study on the characteristics of flow structure and surface morphology of a curved channel** This project plans to carry out a series of experiments in a large-scale curved flume with a mobile bed. Tomo-PIV, SfM three-dimensional terrain reconstruction, three-dimensional laser scanner, and other advanced measurement technologies will be used to measure the flow, sediment, and bedform variation in the flume. Accurate measurement of the bedform development process to study the formation and dynamic characteristics of the bedform under different water flow intensities and the influence of varying bedforms the movement of the flow. Discrimination methods and indicators of equilibrium bedform scales will be proposed to reveal the interaction mechanism between bedform and flow in a curved channel, and further enrich the theoretical system of mechanics of sediment transport and river morphodynamics.	1) MSc in hydraulics and river dynamics, or related areas; 2) Flume experiment experience and programming skills; 3) Excellent spoken and written English.	As from now to 12-31-2024	erosion@iwhr.com
				2. Change mechanism and threshold of soil and water conservation ratio in the Yellow River Basin The project focuses on the Loess Plateau, takes the soil and water conservation ratio as the major study route, to reveal the threshold characteristics and formation driving mechanism for the reduction of area and degree of regional soil and water loss by positioning observation, statistical regression, spatial analysis, model simulation, comprehensive trade-off. Specific objectives of this study were to (1) establish the scientific connotation, characterization index and threshold prediction method of soil and water conservation ratio, (2) determine the thresholds of soil conservation measures (e.g., vegetation, terracing and check dams) and soil conservation rate ratio by multi-factor and multi-objective in the Loess Plateau, and (3) put forward a new era of soil and water conservation layout countermeasures and effectiveness evaluation index system.		As from now to 12-30-2025	
14	Hydraulics and River Dynamics	GUO Xinlei	PhD,MSc	**1. Primary facilitating techniques for winter flow discharge increasing of the Middle Route of China's South-to-North Water Diversion Project** (National Key Research & Development Plan of China) The Middle Route of China's South-to-North Water Diversion Project is one of the main elements for national water grid involving drawing water from Han River to dry north. Under the background of increasing water demand in capital cities like Beijing, Tianjin and Zhengzhou, who have already used "southern water" as the main resource, it is vital to improve the total water transfer in winter. The objectives are to: (1) illustrate water temperature distribution and ice distribution in the central route in support of developing smart flood forecasting and early warning system; (2) propose high resolution models of water temperature and river ice; (3) develop efficient and ice-free water transfer technologies for increasing flow discharge in winter; (4) investigate dynamic and optimal operations for discharge gate control system; (5) build water management and decision-making platforms.	1) BSc / MSc in Water Resources, Control Engineering, Civil Engineering, Mathematics, Physics, or related areas; 2) Modelling experience and programming skills, preferably in Python, Fortran and C++, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 10-31-2026	guoxinlei@iwhr.com
				2. Dynamic evolvement mechanics and disaster chain effects of ice jams in the Yellow River (Supported by NSFC) Ice flooding in the Yellow River is one of the most significant natural disasters for the spring and winter periods in China. To prevent the ice flooding disasters, the objectives of this project are to: (1) investigate river ice situations and typical ice evolution processes for understanding spatial and temporal variations in Yellow River; (2) sketch the chain processes of freeze-up ice jams and break-up ice dams for avoiding ice flooding; (3) quantify the coupling processes between flow-ice-sediment and flow-ice-dike interactions in illustrating ice effects on river evolution; (4) develop the new generation model of river ice simulation and forecasting for the Yellow River based on flow-ice-sediment coupled models and artificial intelligence models with the key ice dynamic criteria; (5) construct ice flooding control and prevention system in the Ning-Meng reach of Yellow River.		As from now to 12-31-2025	guoxinlei@iwhr.com

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15	Hydraulics and River Dynamics	ZENG Li	PhD,MSc	**Hydrodynamic Mechanisms and Simulation of Migration of Microcystis in A Density Current** The hydrodynamic mechanisms and modelling of Microcystis migration in density currents are significant for effectively predicting the risk of Microcystis blooms, accurately assessing their impact range and duration, and proposing reasonable countermeasures. The project is to observe the morphological evolution of Microcystis on the microscale, identify the critical hydrodynamic factors and thresholds that affect the fragmentation and aggregation of Microcystis populations, and reveal the characteristics of the distribution of Microcystis populations in a typical density current, based on a combination of theoretical analysis, experimental observation, numerical calculations, and field measurement. This project is also to establish a model accounting for the morphological changes of Microcystis populations and construct a numerical simulation platform for the distribution of Microcystis population in the typical density current.	1) Strong interest in environmental hydraulics and eco-hydraulics. 2) Good experiences in numerical simulation.	2023-2025	lizeng@iwhr.com
16	Hydraulic Structure Engineering	JIA Jinsheng	PhD	**Structure optimization for Cemented Material dams and high concrete dams** 1. Cemented Material Dam (CMD) is a new type of dam proposed in 2009, which includes CSGR, CSG, CSD, etc. It has advantages of high resistance against overtopping, high adaptability to geological terrain, and low requirements for raw materials. CMD has developed rapidly worldwide and more than 40 projects had been built in China. The structure optimization and material properties are needed to be further studied based on the practices. 2. Investigation on high concrete dams. There are a lot of concrete dams higher than 200m.Investigation on the structure and material for concrete (or RCC) dams higher than 200m are necessary in order to guarantee the dam safety.	1. MSc in hydraulic engineering, civil engineering, soil and related areas; 2. Experience on simulation analysis and material investigation; 3. Excellent spoken and written English.	As from now to 12-30-2027	jiajsh@iwhr.com
17	Hydraulic Structure Engineering	LIU Yi	PhD,MSc	**Safety assessment and numerical simulation of hydraulic structures, temperature and crack control in massive concrete dams, intelligent construction and safety management of hydraulic structures.** 1. Temperature and crack control in massive concrete is an important topic in concrete dam construction. The research on the simulation of stress and temperature field in high concrete dams or other important hydraulic structures by finite element method is required to guarantee the safety and performance of dams. 2. With more than 98,000 dams in total including 40% of the world's largest dams, China has strong economical and societal demands in dam construction and management. New information and artificial intelligent technologies provide paths for higher efficiency in construction and management of dams. Conducting research and solving key problems in the intelligent era are necessary to achieve the construction of digital twin dams.	1. MSc in hydraulic engineering, civil engineering, soil and related areas; 2. Experience on numerical simulation analysis of hydraulic structures or AI development; 3. Excellent spoken and written English.	As from now to 12-30-2027	liuyi@iwhr.com
18	Hydraulic Structure Engineering	ZHANG Guoxin	PhD,MSc	**Study on working performance of super high arch dam during construction period** 1) Deformation characteristics and monitoring technology of super high arch dam during construction period；2) Research on direct stress monitoring method and stress state development process of high arch dam；3) Study on the real working performance of super high arch dam during construction and initial impoundment **Study on crack generation mechanism and crack prevention method of concrete panel of high concrete face rockfill dam** 1) Study on mechanical properties of concrete slab and rockfill; 2) Simulation of interaction between panel and rockfill; 3) Stress development law and crack generation mechanism of panel; 4) Research on panel crack prevention method	1)MSc in hydraulic engineering, Civil Engineering, Mathematics, Physics, or related areas; 2) Understand the calculation principle of finite element method, skilled use of relevant finite element analysis software, such as ANSYS, Abaqus, etc; 3) Modelling experience and programming skills, preferably in Python, proven by previous studies and work; 4) Excellent spoken and written English.	As from now to 12-30-2026 As from now to 12-30-2027	zhanggx@iwhr.com

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19	Hydraulic Structure Engineering	LI Bingqing	PhD,MSc	**1. Key technologies for functional durability assurance of hydraulic concrete structures include:** （1）Development of theoretical and methodological approaches to surface protection system design for hydraulic concrete structures. （2）Development of a series of materials that are suitable for use in complex environments, including anti-seepage,abrasion resistance, anti-algae, anti-roughness, and ice-resistant materials. （3）Construction of a coating water immersion durability prediction method and model based on the content of urea bonds. （4）Invention of a surface waterproofing structure for expansion joints that is resistant to high internal and external water pressure. （5）Establishment of a rapid non-destructive testing technology for the waterproofing effectiveness of expansion joints in large hydraulic structures.	1) MSc in Control Engineering, Civil Engineering, Mathematics, Physics, or related areas; 2) Modelling experience and programming skills, preferably in Python, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-30-2024	libq@iwhr.com
				2. The integrated theoretical and technical system for monitoring, diagnosing, early warning, and preventing rock slope rupture using microseismic technology in hydraulic engineering (1) A support theory has been established that demonstrates the inherent connection between non-uniformity and non-linear progressive failure of rock slope. (2) The implementation of an integrated early warning system that combines microseismic monitoring, force monitoring, and displacement monitoring. (3) An integrated system has been developed for simulating and monitoring the stability of rock slopes.		As from now to 12-30-2027	libq@iwhr.com
20	Hydraulic Structure Engineering	LIU Youzhi	PhD,MSc	**1.Tracking simulation and feedback of the whole life cycle working behavior of Baihetan arch dam** Key research content :Construction of super high arch dam- Key technologies of operation life cycle performance simulation and safety assessment	1) BSc / MSc in Hydraulic Engineering, Civil Engineering, Mathematics, Physics, or related areas; 2) Modeling experience, simulation calculation, programming skills, proved by previous research and work ; excellent oral and written 3) Excellent spoken and written English.	As from 6-2017 to 12-2024	youzl@iwhr.com
				2.Water conveyance from chaoerhe to xiliaohe river information project-Life cycle intelligent management and control system integration Key research content :Long distance water diversion project construction- Intelligent control method and key technology of operation safety		As from 6-2021 to 12-2026	youzl@iwhr.com
21	Hydraulic Structure Engineering	LI Songhui	PhD,MSc	**Key technologies of intelligent dam construction** Aiming at the temperature control problem of mass concrete structure construction, hardware, software and mathematical models are developed. The whole-link monitoring of temperature control quality is carried out by means of informatization, digitization and intelligence, so as to ensure the timely, accurate, real and systematic monitoring and control information, and the precision of temperature control construction is promoted by the intelligence of temperature control and monitoring.	1) BSc / MSc in Hydraulic Engineering, Civil Engineering, Structural Engineering, Mechanical Engineering, or related areas; 2) Modelling experience and programming skills, structural design and manufacturing experience, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-30-2027	lish@iwhr.com

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22	Hydraulic Structure Engineering	ZHANG Lei	PhD,MSc	Engaged in temperature control and crack prevention of large volume concrete structures, intelligent monitoring, non-linear numerical simulation analysis and safety assessment of hydraulic structures, high-performance computing, etc. Responsible for temperature control and crack prevention, intelligent monitoring, and dam safety assessment research of more than ten projects such as Yebatan, Lava, Maiwan, TB, JX, GS, GX, BDa.	1) BSc / MSc in hydraulic engineering, civil engineering, soil and related areas; 2)Experience on simulation analysis and material investigation or intelligent monitoring; 3)Excellent spoken and written English.	As from now to 12-30-2027	3040252@qq.com
23	Hydraulic and Hydropower Engineering	LI Yinong	PhD	**1. "Sky-Air-Ground" integrated intelligent control system for high water efficiency agriculture** Introduction: Aiming at the mapping between the physical and digital scenes of agricultural water efficiency at the regional level and the technical problems of collaborative optimization and decision-making of agricultural water efficiency, the project closely focuses on the construction of intelligent management and control system of high water efficiency agriculture, carrying out four aspects of research on key information collection and multi-source fusion reconstruction of agricultural water efficiency, distributed quantitative model system of high water efficiency agriculture, multi-scene intelligent decision-making technology of high water efficiency agriculture, and intelligent management and control platform of high water efficiency agriculture.	(1) BSc / MSc in Remote Sensing, Irrigation and Drainage Engineering, Hydrology and Water Resources, or related areas; (2) Modelling experience, water allocation and optimization, programming skills, preferably in Python, proven by previous studies and work; (3) Excellent spoken and written English.	As from now to 12-30-2025	liyinong@iwhr.com
				2. Spatiotemporal diagnosis and prediction technology of agricultural irrigation water consumption information Aiming at the key issues of real-time spatial monitoring of agricultural irrigation water consumption for limited water resources efficient utilization and ecological environment protection, the project closely focuses on the research and development of spatiotemporal diagnosis and prediction technology for irrigation water information in irrigation areas, carrying out four aspects of research on spatiotemporal distribution characteristics and key factors of irrigation water information, remote sensing parameter ranges for different water scarcity levels, irrigation water information data assimilation system models, irrigation water demand prediction technology based on weather forecasting and spatiotemporal coupling of multi-source information.		As from now to 12-30-2025	
				1. Study on Optimal and Stable Operation Strategy for Francis Turbine Generator Units 1. Summarize the operation experience of hydropower stations in recent years, analyze the requirements of power grid for hydropower station operation, propose the existing problems in operation and research directions for optimal operation; 2. Based on existing condition monitoring platforms and ultrasonic flow meters, conduct performance tests on hydropower units with different water heads and outputs to comprehensively grasp the stability and efficiency changes of the units under different conditions; 3. Optimize the load distribution of the unit by comprehensively considering the energy characteristics and unit stability characteristics of the hydraulic turbine by multi-objective optimization method, and obtain the optimal generation strategy; 4. Develop real-time optimization software and apply it to hydropower units to guide their stable and efficient operation.	1) BSc / MSc in Civil Engineering, Materials Science and Engineering, or related areas; 2) Modelling experience and programming skills; 3) Excellent spoken and written English.	As from now to 12-30-2023	

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24	Hydraulic and Hydropower Engineering	PAN Luoping	PhD,MSc	**2. Verification and Research on Stability and Efficiency Characteristics of Megawatt Turbine Generator Unit of Baihetan Hydropower Station** 1. Master the energy characteristics, stability, and noise of the unit under each test head; 2. Master the range and vibration level of the unit vibration zone under each test head. 3. Master the stable operation area and operation status of the unit under each test head. 4. Master the unit efficiency level under each test head. 5. Compare the efficiency characteristics of the unit's real machine and model test results. 6. Draw the operation characteristic curve of the real machine at full head. 7. Measure and analyze the operating noise level of each part of the unit. 8. Measure and analyze the vibration characteristics of adjacent key parts of the unit.	1) BSc / MSc in Water conservancy and hydropower engineering, Control Engineering, Civil Engineering, Mathematics, Physics, or related areas; 2) Modelling experience and programming skills, preferably in Python, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 8-31-2024	panlp@iwhr.com
				3. Research on International Standards for Vibration Measurement and Evaluation of hydraulic power generating and pump-storage plants 1. Carry out research on the installation position of sensors for vibration measurement, and the calculation value of bearing runout; 2. Conduct stability data analysis and testing of hydropower units to determine the impact of operating and design parameters on unit stability; 3. Conduct vibration evaluation research on Francis turbine units at no-load and 45% - 70% rated load to expand the scope of vibration evaluation; 4. Conduct correlation analysis including data characteristics analysis for different loads and rotational speed ranges, determine whether there are significant differences between the 45% - 70%, 70% - 100% data statistics, and determine whether there are significant differences between the 0-100, 100-250, 250-375, and 375-750 rpm data statistics (under 70% - 100% load); 5. Analyze the rationality and feasibility of different classification method for turbine generator Unit, and study and determine the best classification method.		As from now to 12-30-2025	
25	Hydraulic and Hydropower Engineering	ZHANG Baozhong	PhD,MSc	**1. Mechanism and quantitative characterization of evapotranspiration in farmland under land-air coupling** This project taking the land-atmosphere coupling mutual feedback as a starting point to study the associated coupling mechanism of land surface processes and atmospheric change, and the mechanisms of land-atmosphere coupling effect on atmospheric evaporation capacity are clarified. In addition, the synergistic response mechanisms of field evapotranspiration to crop physiological and ecological soil water supply and atmospheric evaporation capacity are revealed, and a series of response parameter correction functions and characterization equations are proposed to form the multi-process characterization theory and method of evapotranspiration based on land-atmosphere coupling.	(1) BSc / MSc in Agricultural Meteorology, Atmosphere, Hydrology and Water resources, Applied Mathematics or related areas; (2)Modelling experience and programming skills, preferably in Python, proven by previous studies and work; (3)Excellent spoken and written	As from now to 12-30-2026	zhangbaozhong333@.163com
				2. "Sky-Air-Ground" integrated intelligent control system for high water efficiency agriculture Aiming at the mapping between the physical and digital scenes of agricultural water efficiency at the regional level and the technical problems of collaborative optimization and decision-making of agricultural water efficiency, the project closely focuses on the construction of intelligent management and control system of high water efficiency agriculture, carrying out four aspects of research on key information collection and multi-source fusion reconstruction of agricultural water efficiency, distributed quantitative model system of high water efficiency agriculture, multi-scene intelligent decision-making technology of high water efficiency agriculture, and intelligent management and control platform of high water efficiency agriculture.		As from now to 12-30-2025	

No.	Program	Supervisor	Degree Type	Project and its introduction	Student Requirement	Duration	Contacts
				3. Modern irrigation district digital twinning and optimization control technology innovation team The project focuses on the key links of digital twining and optimal regulation in modern irrigated areas, and carries out researches from the aspects of real-time prediction of spatio-temporal situation of water demand process in irrigated areas, real-time interactive simulation of water supply and distribution process in irrigated areas, accurate measurement of water use information in irrigated areas, intelligent decision-making and regulation of water use in irrigated areas, etc. The research contents include real-time prediction method of multi-temporal situation of water demand process in irrigated areas, real-time interactive simulation technology of water transport and distribution process in irrigated areas, water consumption measurement technology and products, intelligent decision-making and regulation technology of water use in irrigated areas.	English.	As from now to 12-30-2025	
26	Hydraulic and Hydropower Engineering	Han Songjun	PhD,MSc	**Wet surface evaporation mechanism under the influences of advections: from pans, farmlands to lakes** Wet surface evaporation widely occurs in the pans, rivers, channels, irrigated lands, reservoirs and lakes. As the physical foundation of the concept of “potential evaporation”, precisely representing wet surface evaporation process is the precondition of advancing actual evaporation estimation. Advection is a key process of wet surface evaporation, and has obvious scaling effects. This project focuses on the wet surface evaporation mechanism under the influences of advections. Evaporation processes over different wet surfaces, from pans, farmlands to lakes, will be observed and simulated. The mechanism and scale effects of advections on the wet surface evaporation will be studied, and the dominant factors will be revealed.	1) BSc / MSc in Civil Engineering, Hydraulic Engineering, or related areas; 2) Modelling experience and programming skills, preferably in MATLAB, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-30-2024	hansj@iwhr.com
27	Hydro-environment	SUI Xin	PhD,MSc	**Study on sustainable development on environmental and social status of the A River Basin (herein referred as ARB) based on facts and predictions of the future.** This project is conducted by research teams in the following topic areas: A:Hydrology and water quality, including hydrological analysis, sediment and geomorphology, water quality; B: Aquatic ecology; C:Terrestrial ecology; D:Environmental risks and mitigation measures; E: Economy and benefits; F: Agriculture, forest and fishery; G: Natural and cultural heritage; H: Resettlement, community safety and transportation; I: Poverty, employment and stakeholder engagement; J: Development of A Delta.	1) BSc/MSc in Environmental and social impact assessment EIA, or related areas; (2) Modelling experience and programming skills, preferably in social, ecosystem, InVEST by previous studies and work; (3) Excellent spoken and written English.	As from now to 12-30-2025	suixin@iwhr.com
28	Hydro-environment	Gao Bo	PhD,MSc	**Aging process of microplastics in the soil of the water-level-fluctuating zone (WLFZ) in the Three Gorges Reservoir (TGR) and its influence mechanism on greenhouse gas (GHGs) emission.** In this project, MPs in the typical WLFZ soils in TGR will be selected as research object. The project will combine the field sampling, in situ culture experiment and laboratory simulation experiment and use the different advanced analysis techniques (micro-Raman spectroscopy, atomic force microscopy, electrospray ionization Fourier transform ion cyclotron resonance mass spectrometry, enzyme activity, metagenomic sequencing). The aims of this program are: (1) to identify the occurrence characteristics and the mechanism of source and sink transformation of MPs in WLFZ soils under the anti-seasonal regulation mode; (2) to reveal the aging mechanism of MPs in WLFZ soils; (3) to clarify variation characteristics of carbon and nitrogen cycling microbial community in soil and MPs biofilm under the anti-seasonal regulation mode; (4) to elucidate the effects of MPs on WLFZ soil GHGs emission and related mechanisms under alternating wetting and drying in WLFZ.	1) BSc / MSc in Environmental Science and Technology, Environmental Chemistry, Analysis Chemistry or related areas; 2) Environmental sample collection, pretreatment and analysis capabilities experience and skills, preferably in microplastic analysis and characterization, proven by previous studies and work; 3) Excellent spoken and written English.	As from now to 12-30-2026	gaobo@iwhr.com

No.	Program	Supervisor	Degree Type	Project and its introduction	Student Requirement	Duration	Contacts
29	Hydroinformatics	LU Jingxuan	PhD	**1. Remote sensing monitoring and recognition of irrigated area** Methods for recognition of irrigated area and irrigation times based on multi-source satellite remote sensing, and construction of standard irrigation spectrum library and parameter library. **2. Evaluation of irrigation water consumption.** Calculate irrigation water consumption based on remote sensing monitoring results of irrigation area and water balance method. **3. Evaluation of irrigation water efficiency.** Evaluate and analyze the utilization coefficient and irrigation water benefit based on monitoring of crop growth, irrigated area and irrigation volume.	1) Knowledge and skills of satellite remote sensing and geographic information system (GIS), proficient in satellite image processing. 2) Knowledge and skills of remote sensing hydrology, preferred for experience in satellite retrieval of evapotranspiration and soil moisture.	As from now to 12-30-2027	songwl@iwhr.com
30	Water Disaster and Security	Philippe Gourbesville	PhD	**1.Advanced hydrological modelling approaches for large catchments** 1) review of existing distributed deterministic hydrological models 2) benchmark and selection of key components to integrate 3) rewriting equations with an approach allowing parallel and high-performance computing approach 4) test and validation over a large catchment 5) integration within a cloud-based environment.	1) MSc in Applied Mathematics, Control Engineering, Civil Engineering, Physics, or related areas 2) Coding and programming skills for advanced numerical methods and physical processes. 3) Knowledge and experience on parallel computing strategies and high-performance computing environments. 4) Mastering English communication (oral and written) 5) Motivation for teamwork.	From Jul. 2023 to 9- Sep.2027	phg@iwhr.com
				2. Cloud based environment for hydrological and hydraulic modelling 1) technical assessment of needs for cloud-based environment able to welcome distributed deterministic hydrological models and large datasets 2) definition of potential architecture 3) definition of standards for hydrological models/modules to integrate within the cloud-based platform 4) implementation of models and validation of the scalable computing architecture 5) deployment and validation of the environment	1) MSc in Computer sciences, Control Engineering, Applied Mathematics, Civil Engineering, Physics, or related areas 2) Coding and programming skills for advanced modelling environments including cloud technologies and large datasets management. 3) Knowledge and experience with complex modelling systems and cloud architecture. 4) Mastering English communication (oral and written) 5) Motivation for teamwork.	From Jul. 2023 to 9- Sep.2027	phg@iwhr.com

No.	Program	Supervisor	Degree Type	Project and its introduction	Student Requirement	Duration	Contacts
31	Water Disaster and Security	LV Juan	PhD	**Water resources allocation and scheduling for severe drought** 1. Aiming at the challenge that how to dynamically allocate water resources under the threat of extreme drought, the project will develop the technology to progressively and dynamically assess the drought impacts on different objects including agriculture, city, and ecology with water shortage. 2. The project plans to study on water resources dynamic allocation, water resource optimization and scheduling under the emergency of extreme drought by coupling water network and extreme drought evolution processes.	1) MSc in hydraulic engineering, earth sciences and environment engineering, or related areas; 2) Modelling experience and programming skills, preferably in the field of hydrology and water resources; 3) Excellent spoken and written English.	As from now to Dec. 30. 2027	lujuan@iwhr.com