国合环境研究院

AWR Environmental Research Institute

院长致辞

Words from the President

值“国家城市非传统水资源开发利用国际科技合作基地”（简称“国合基地”）正式落户“中国宜兴环保科技工业园”（简称“环科园”）并成立“国合环境研究院”之际，衷心感谢宜兴市及环科园领导、国内外环境界朋友和同仁的关心和厚爱！

国合环境研究院是基于2015年12月环科园与国合基地签署的战略合作协议而成立的，作为产学研相结合的国际型科研机构落户宜兴，其重要使命一是为环科园的环境保护与建设提供科研技术服务，二是为国内外环境科技合作提供研发平台，三是推动环境保护领域的新理念、新技术的推广应用和工程转化。借助环保之乡宜兴的地缘优势，为我国环境科技的发展和国际交流做出应有的贡献。

我本人在国外学习工作十年，回国从事环境教育和科技研究也逾十八个年头。我与我的团队在得到科技部国际合作计划支持，获准建立国家级示范型国合基地之后，一个愿望就是走出高校，融入社会，立足国内，面向世界，走出一条新的环境科技合作道路。希望这本小册子能帮助各位同仁了解国合环境研究院，支持国合环境研究院，通过各种途径的合作实现共赢！

On the occasion when the "International Science & Technology Cooperation Center for Urban Alternative Water Resources Development" (hereinafter referred to as "Int'l AWR Center") is officially settled in "China Yixing Industrial Park for Environmental Science & Technology" (hereinafter referred to as "ES&TP") to establish the "AWR Environmental Research Institute" (hereinafter referred to as "AWRERI"), I sincerely thank to the leaders of Yixing City and ES&TP, and friends and colleagues in the environmental field for your valuable supports!

The establishment of AWRERI is based on the "strategic cooperation agreement" signed between ES&TP and Int'l AWR Center in December 2015. As an international institution combining industry, education and research, the important missions of AWRERI are firstly to provide scientific and technical services to ES&TP for environmental protection, secondly to provide a platform for the development of environmental science and technology cooperation at home and abroad, and thirdly to promote the application of new concepts and technologies for environmental protection. With the help of the geographical advantages of Yixing as an environmental industry city, AWRERI will make contributions to the development of environmental science and technology and the promotion of international exchange.

I myself have the experiences of studying and working in foreign countries for ten years, and afterwards taking part in environmental education and research in China for more than eighteen years. After the approval of the Ministry of Science and Technology for establishing the Int'l AWR Center in China, I and my team made a firm decision to go out of the university campus to the society, be based in China while face the world, and break a new path for environmental science and technology cooperation. Through this booklet, we wish our friends can understand AWRERI, support AWRERI, and build win-win cooperative relationships with AWRERI through various ways.


Xiaochang Wang
Ph.D/Professor
IWA Distinguished Fellow

院长简介

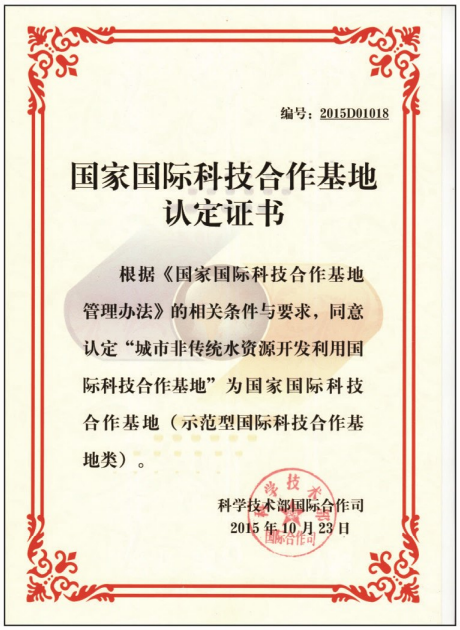
President Introduction

国合环境研究院院长王晓昌教授，四川省成都市人，1982年和1984年在西安建筑科技大学获学士和硕士学位后留校任教，1988—1992年在日本北海道大学攻读博士学位，师从国际水协会（IWA）前主席Norihito Tambo教授，获博士学位后先后在日本水道机工株式会社和八千代工程株式会社担任研究员和高级工程师，并作为日本国际协力机构（JICA）环境专家赴中东、东南亚、非洲、大洋洲从事国际技术援助工作。1998年回国，先后担任西安建筑科技大学环境与市政工程学院院长、大学副校长职务。曾任国务院学位委员会第五、第六届学科评议组成员（环境科学与工程），国家自然科学基金委第十一届咨询委员会委员，担任中国城镇供排水协会理事、中国土木工程学会水工业委员会理事、中国环境科学学会环境教育委员会副主任、国家重大水专项城市主题专家组成员、西北水资源与环境生态教育部重点实验室主任、国家城市非传统水资源开发利用国际科技合作基地主任。2011年入选国际水协会会士（IWA Fellow），2014年入选国际水协会杰出会士（IWA Distinguished Fellow），在IWA出任程序委员会共同主席（Co-Chair）、未来城市专家委员会委员、非传统水资源专家委员会中国区主席、膜技术专家委员会中国分会副主席。

As the President of AWRERI, Professor Xiaochang Wang obtained his BE and ME degrees from Xi'an University of Architecture and Technology (XAUAT) in 1982 and 1984, respectively, and then worked as a lecturer in XAUAT. From 1988 to 1992 he studied in Hokkaido University, Japan for the PhD degree in Environmental Engineering under the supervision of Professor Norihito Tambo, the former President of International Water Association (IWA). Afterwards, he worked as research engineer and chief engineer in Suido Kiko Co. Ltd and Yachiyo Engineering Co. Ltd, Japan until 1997. In that period, he took part in a number of international cooperative projects supported by Japan International Cooperation Agency (JICA) in the Middle East, South-east Asia, Africa and South Pacific regions as an environmental expert. He returned to China in 1998 and worked again in XAUAT as a professor. He successively served as Dean of the School of Environmental and Municipal Engineering and Vice President of XAUAT. He was academically active in China and acted as Member of Academic Evaluation Committee of the State Council of China, Member of Advisory Committee, National Natural Science Foundation of China, Board Member, China Urban Water Association, Board Member, Industrial Water Association, China Society of Civil Engineering, Vice Chairman of the Environmental Education Committee, China Society of Environmental Sciences, Member of the Expert Committee for National Major Projects, Director of the Key Lab of Northwest Water Resources, Environment and Ecology, Ministry of Education, and Director of the Int'l AWR Center. He was nominated IWA Fellow in 2011 and IWA Distinguished Fellow in 2014. He also served IWA as Co-Chair of the IWA Program Committee, Member of the Steering Committee, IWA Cities of the Future Program, Chairman of the IWA Alternative Water Resources Cluster–China Chapter, and Vice-Chairman of the IWA Membrane Technology Task Force– China Chapter.

国家城市非传统水资源开发利用国际科技合作基地

International Science & Technology Cooperation Center for Urban Alternative Water Resources Development



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国家国际科技合作基地
认定证书

根据《国家国际科技合作基地管理办法》的相关条件与要求，同意认定“城市非传统水资源开发利用国际科技合作基地”为国家国际科技合作基地（示范型国际科技合作基地类）。

科学技术部国际合作司
2015 年 10 月 23 日

2014年7月，西安建筑科技大学与国际水协会（IWA）签署了共建协议，合作建立了“城市非传统水资源开发利用国际科技合作基地”，并于2015年3月通过陕西省科技厅认定，同年10月又经科技部国际合作司认定为国家国际科技合作基地（示范型国际科技合作基地类），成为该领域首个在政府支持下获准的国家级国际科技合作平台。国合基地的建立旨在聚集国际一流水环境专家，以IWA未来城市研究计划和非传统水资源研究计划为合作纽带，面向城市可持续发展的相关水问题，尤其是城市非传统水资源利用问题，开展理论、技术和工程示范研究，立足地方，面向全国，辐射世界，在水环境领域研发、交流、技术应用等各方面发挥重要作用，实现技术创新和产业推广。

An agreement was signed between Xi'an University of Architecture and Technology (XAUAT) and International Water Association (IWA) in July, 2014 for the establishment of the International Science & Technology Cooperation Center for Urban Alternative Water Resources Development. The Int'l AWR Center was approved by the Department of Science and Technology, Shaanxi Province in March, 2015 and further approved by the Department of International Cooperation, Ministry of Science and Technology in October, 2015. It is now the first international cooperative platform of this kind under the support of the Chinese government.

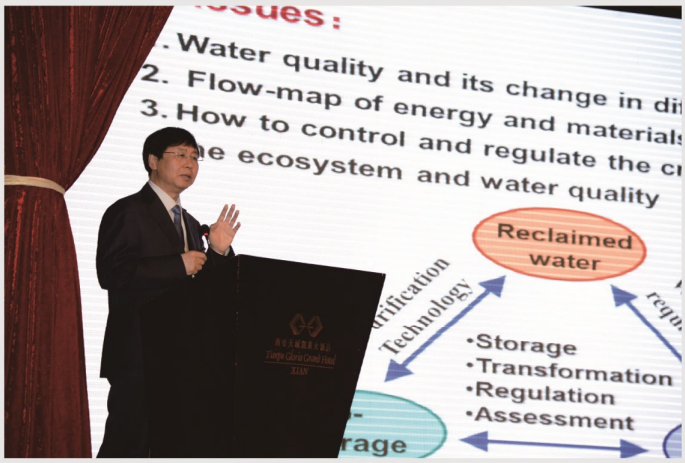
国合基地启动仪式

Opening Ceremony of the Int'l AWR Center

2016年4月2日，国家城市非传统水资源开发利用国际科技合作基地启动仪式在西安举行。出席仪式的近200名国内外嘉宾中，有国际水协会前主席、美国工程院院士Glen Daigger教授，国际水协会前主席David Garman教授，国际水协会前执行主席Paul Reiter先生等来自国外的著名水环境专家，来自国内的曲久辉院士、任南琪院士等著名水环境专家。宜兴市委常委、中国宜兴环保科技工业园管委会主任朱旭峰先生亲临了启动仪式并致辞，科技部国际合作司靳晓明司长派代表出席并通过录像致辞。国合基地聘请Glen Daigger教授和曲久辉院士担任国际顾问委员会主任，任南琪院士担任学术委员会主任。国合基地主任王晓昌教授以“面向未来的城市非传统水资源开发利用”为题，向国内外嘉宾汇报了国合基地的科技合作示范思路和发展愿景。

The Opening Ceremony of the Int'l AWR Center was held on April 2, 2016. About 200 guests from home and abroad attended the ceremony, including Prof. Glen Daigger, Past President of IWA, Prof. David Garman, Past President of IWA, Mr. Paul Reiter, Past Executive Director of IWA from overseas, and Prof. Jiuhui Qu, Member of Chinese Academy of Engineering, Prof. Nanqi Ren, Member of Chinese Academy of Engineering. Mr. Xufeng Zhu, Director of China Yixing Industrial Park for Environmental Science and Technology attended the ceremony and delivered his address. Mr. Xiaoming Jin, Director of the Department of International Cooperation, Ministry of Science and Technology also addressed to the ceremony via video. An International Advisory Committee, headed by Prof. Glen Daigger and Prof. Jiuhui Qu, is organized to provide advices to the management and operation of the Int'l AWR Center, and an Academic Committee, headed by Prof. Nanqi Ren, is organized to perform academic leadership to the Int'l AWR Center.

2016 International Symposium on Alternative Water Resources Development & Opening Ceremony of The Int'l AWR Center



国合基地启动仪式

OPENING CEREMONY OF THE INT'L AWR CENTER

国合环境研究院

AWR Environmental Research Institute (AWRERI)

国合环境研究院是国家城市非传统水资源开发利用国际科技合作基地与中国宜兴环保科技工业园合作建立的产学研结合的国际型科研机构，也是国合基地在宜兴设立的分中心。基于已有的研究团队十余年的科研积累及形成的特色，国合环境研究院在起步阶段的基本方针是：坚持一个核心理念，围绕两个重点方向，发挥三个重要作用。

AWRERI is an international institution combining industry, education and research under the full cooperation between the Int'l AWR Center and China Yixing Industrial Park for Environmental Science and Technology. It is also a branch of the Int'l AWR Center in Yixing City. Based on our experiences accumulated in the past years and the characteristics of research work, the basic principles for AWRERI in the initial stage are: to adhere to one core concept, focus on two key directions, and play three important roles.

1 One Core Concept 个核心理念

- 流域（区域）水循环管理的理念

The concept of water cycle management for basins or regions

--最大限度维持水文循环过程的自然性

To maintain the hydrological cycle as it is, as far as possible

--尽可能依照自然法则进行系统设计及技术选择与集成

To follow the nature's manner, as far as possible, in system design and technology selection/integration

2 Two Key Directions 个重点方向

- 非传统水资源开发利用

Alternative water resources development and utilization

- 健康水生态系统构建与水环境安全保障

Construction of healthy water ecosystem and water environment security

3 Three Major Missions 个重要作用

- 为环科园的环境保护与建设提供科研技术服务

To provide scientific and technical services to ES&TP for environmental protection

- 为国内外环境科技合作提供研发平台

To provide a platform for the development of environmental science and technology cooperation at home and abroad

- 推动环境保护领域的新理念、新技术的推广应用和工程转化

To promote the application of new concepts and technologies for environmental protection

国际水协会

International Water Association

国际水协会于1999年由原国际供水协会和国际水质学会合并而成，作为世界水环境领域最权威的专业学术组织，提倡以水的综合性管理为最佳策略在世界范围提供安全供水和卫生设施，促进最新知识和技能的实际应用和相互交流，通过包括会议、专家网络、出版物和电子媒介在内的各种方式在全球范围内进行宣传推广。

国际水协会下设50多个专家委员会，遍及供水、排水、水资源、水环境保护、水污染治理等各个领域，聚集了全世界上百个国家的水环境科学家和工程技术人员参与活动。国际水协会设立了多种奖项用于激励在智慧型水管理及应用方面的创新性思维及卓越的治理方案。

国际水协会每年在世界各地组织和举办近百个不同规模的水行业交流会议，以探讨前沿技术的研究成果，制定行业发展政策，设计和推行实用的水管理系统与制度。国际水协会创办了国际级出版社（IWA Publishing），每年出版上百部学术与技术专著，主办包括水环境领域顶级期刊Water Research在内的17部学术期刊。

IWA
the international water association

International Water Association(IWA)

International Water Association (IWA) was established by the merger of International Water Supply Association (IWSA) and International Association of Water Quality (IAWQ) in the year of 1999. As the global not-for-profit professional academic organization, IWA is set up with the aim of helping water professionals create innovative, pragmatic and sustainable solutions to challenging global needs. It provides sector professionals with the tools to sharpen their own service delivery and supports closing the 'know-how' gap in target regions worldwide, and helps towards a world in which water is wisely managed to satisfy the needs of human activities and ecosystems in an equitable and sustainable way.

IWA has set up over 50 expert committees gathering the researchers, utilities, consultants, industry, regulators around the world in the area of water supply and drainage, water resources, water environment protection, water pollution control to facilitate multi-level cooperation, and sharing of the very best of knowledge on water science, research and management worldwide. IWA Awards aim to become a vehicle through which IWA encourages and rewards innovation and sets international benchmarks for innovative thinking, and application of solutions for wise water management and practice.

Every year, IWA organizes and sponsors many specialized conferences and seminars on a wide variety of topics in water management in locations worldwide. As a leading international publisher of water, wastewater and environmental publications, IWA Publishing offers a high-quality, cost-effective service with information delivery providing researchers and professionals with up to date and authoritative resources. IWA publishing publishes hundreds of book programme includes cutting edge, high quality research for academics as well as reference works and manuals of practice for professionals, and it publishes 17 impact factor leading journals within the field including the journal of Water Research.

国际水协会“未来城市”研究计划

IWA Cities of the Future Program

随着世界人口的快速增长，工业现代化进程加速，气候变化、水污染等问题的不断加剧，城市水设施的维护、更新与建设将成为未来城市管理及系统建设过程中面临的巨大挑战。城市是人类未来主要的栖息地，然而高人口密度及气候变化将对包括水、能源、食物在内的各种资源带来巨大的挑战，同时也将对人类健康、环境及经济的发展带来严重的影响。近年来，融合了创新与社会凝聚力的水敏城市，将成为人类未来理想的居住地。为了创造城市水可持续发展的环境，人类应该共同意识到潜在的水危机并分享先进的知识与经验。

作为国际水协会重要的研究计划之一，未来城市研究计划为城市可持续发展的水管理方式提供了创新思维和解决方案。未来城市研究计划的重要目标是让全社会意识到，水以及水与其他能源之间的相互作用将成为全世界城市地区未来发展的中心焦点，鼓励城市水管理机构与相关技术人员及机构，重视水管理系统与城市服务的关联性并创新性地进行再设计，为社会提供可持续的水服务，提高城市生活环境质量。

Rapid population growth, industrialization, climate change, water pollution, and maintaining, renewing and expanding urban water infrastructure are just some of the unprecedented challenges facing urban water management and systems. Cities are the future for humanity, but the failure to manage higher population density or climate change can result in a threat to resources-water, energy, food- and have a profound impact on human health and well-being, the environment and the economy. Water sensitive cities are great places to live, where innovation, social cohesion, creativity and culture flourish. To create sustainable water in cities, all stakeholders need to act to avoid the looming water crisis. We need to share experience and knowledge, and track progress.

The Cities of the Future agenda harnesses the power of the IWA network to co-create solutions and join efforts to manage a city's many waters in a sustainable and resilient manner, an approach endorsed by the IWA Principles for Water Wise Cities. The overall objective of the IWA Cities of the Future program is to recognize that water, and its interactions with other urban sectors (e.g. energy, transportation, etc), is a central focus in the development and redevelopment of urban areas in the world. The society need to encourage urban water managers to systematically collaborate with other professionals and the local community to creatively redesign water management systems integral with other city services in order to deliver sustainable water services but at the same time to enhance life both within and beyond the urban environment.

国际水协会
非传统水资源研究计划

IWA Alternative Water Resources Cluster

为了解决全球水资源供需不均衡所带来的问题，国际水协会设立了全球非传统水资源研究计划，为全世界不同领域范围内的专家学者及科研人员提供交流与合作的平台，共同分享先进的知识与经验，为确保水的实用性及供需平衡提供集成式的战略计划。

非传统水资源的应用可以有效提高水资源的供给率。非传统水资源研究计划囊括了诸如雨水收集，海水脱盐，污水回用，减少水量流失及节水措施等多种提高传统供水效率的技术研究与应用。

资源供需的平衡应该从整体角度进行考量，同样，供水方案的设计也应该从集成式水服务的整体角度入手。非传统水资源研究计划将采取诸如定量化的创新性评估方法并提高系统的可靠性，应用包括决策制定的风险考量及新政策的标准设定等技术方法。

非传统水资源研究计划通过聚集全世界范围内专家学者的经验与智慧，重点关注非传统水资源的开发与利用，全面地考量并提供集成式的新型供水方案，确保并提高全球供水服务质量。

The focus of the Alternative Water Resources (AWR) Cluster of International Water Association is the definition and development of diverse solutions in order to cope with emerging concerns in the water supply sector, which are mainly related to the increasing divergence between water resources and demands all over the world. The cluster's goal is to provide a platform for discussion and collaboration that allows relevant specialists from across sectors to come together to share best practices and develop strategies for the final aim of ensuring water availability and demand balance with an integrated, portfolio-thinking approach.

In this context, approaches based on alternative water resources would firstly be seen as possible solutions for improving water supply guarantee. This way, a variety of technologies that improve conventional solutions-including rainwater harvesting, desalination, water reuse, water loss reduction and water conservation-are covered under the umbrella of the cluster.

However, resources demand balance should be conceived as a part of service provision so it cannot be analyzed individually. Thus, water solutions need to be drawn up from an integral water service analysis. Some proposals such as novel assessment methods for quantifying and improving system reliability, techniques that include risk as a tool for decision making, or new criteria for renewal policies, between others, are needed.

The AWR Cluster aims to create a collaborative workspace between the IWA's related knowledge areas with a common purpose: providing new water solutions to preserving and enhancing the global water supply service guarantee. This team of experts will review intrinsic and emerging concerns in the water field in order to develop new proposals across sectors. The cluster will highlight new opportunities of innovation to create these holistic solutions. This way, a new meeting space for promoting the integration of water experts from different specialist fields with this common objective is supplied in The AWR Cluster.

中国宜兴
环保科技工业园

China Yixing Industrial Park for Environmental Science & Technology

中国宜兴环保科技工业园是1992年经国务院批准设立的国家级高新技术产业开发区，也是我国唯一以发展环保产业为特色的国家级高新技术产业园区。先后列入国家科技部和环保部“共同管理和支持”单位、《中国二十一世纪议程》第一批优先项目计划。园区经过20年的发展，面积已由初期规划的4平方公里，扩展到212平方公里。宜兴独有的江南山水特色，浓郁的环保文化氛围，塑造了环科园独特的品牌影响力。

围绕环保主题，环科园着力瞄准产业“水、气、声、固、仪”五大领域，先后吸引了美国、日本、德国、荷兰、芬兰、新加坡、香港、台湾等20多个国家和地区的客商来园合资、合作，与哈工大、南大、清华等80多所大学形成紧密型产学研合作，一个集研发设计、生产制造、工程施工、运营服务为一体的产业集群初具雏形。

未来的环科园将是一个经济密集、科技金融活跃的商务新城，一个产业和城市交相辉映、文化和生态融为一体的活力新城，一个令全球瞩目、具有核心竞争力的“中国环保之都”。

China Yixing Industrial Park for Environmental Science & Technology (ES&TP) is the national Hi-Tech Industrial Development Zone which was approved by State Council in 1992. It is also the unique National Hi-Tech Industrial Development Zone features developing environmental protection industry. ES&TP is co-managed and supported by Ministry of Science & Technology (MOST) and Ministry of Environment Protection (MEP), and included in the first batch of priority projects of "China's Agenda 21". During the past 20 years, the initial planning of ES&TP was 4 square kilometers, and now expands to 212 square kilometers. Through the unique charm of landscape in south Yangtze and rich culture of environmental protection, ES&TP habits unique brand influence.

Five major areas of "Water, Air, Sound, Solid, Instrument" go hand in hand, ES&TP continue to strengthen the cooperation with more than 20 countries and regions including the United States, Japan, Germany, Netherlands, Finland, Singapore, Hong Kong, Taiwan, etc., to form the close research cooperation with more than 80 colleges and universities such as HIT, NJU and Tsinghua, to establish the institute of environmental technology, R & D centers and industrial base. A modern industrial park which integrates R & D, manufacturing, engineering, construction, operations services has already taken shape.

The future ES&TP will be a business new town which has intensive headquarters economy, and active technical finance, a vital new town which combines industry and town, integrates cultural and ecology, a capital of Chinese environmental industry which attracts global attention and has core competitiveness.

国家“十一五”重大水专项项目

城镇水污染控制与治理共性关键技术研究与工程示范 (2008ZX07317)

项目负责人：王晓昌

National Major Project: Technological Research and Engineering Demonstration of Urban Water Pollution Control and Governance

Project Leader: Xiaochang Wang

项目针对我国城镇水污染控制与治理的共性技术需求，研究了以管网截污、处理降污、污泥无害化处置为主的城市水环境污染源削减技术，以黑臭河道工程修复、景观河湖生态水质改善为主的城市水环境污染治理技术，以城市生活与工业节水、雨污水再生利用为主的城市节水减排与水再生利用技术，以及小城镇水污染控制与治理技术。就各类关键技术提出了35部导则、指南、标准或规范的建议，申请发明专利142项、软件著作权9项，开发出技术设备37套，建成了各类示范工程40项，有效促进了示范区的水污染控制和水环境改善，形成了城镇水污染控制与治理共性关键技术体系。

To meet the common requirements for urban water pollution control and governance in China, comprehensive studies were conducted firstly for pollutant source control and reduction by effective wastes collection, enhanced wastewater treatment, and sludge disposal to prevent the secondary pollution, secondly for water quality improvement of polluted rivers/lakes by engineering restoration and ecological remediation, thirdly for water conservation by domestic and industrial water saving, water reclamation and reuse, and fourthly for the development of applicable technologies for water pollution control in small towns. The outputs from the project included 35 proposals of guidelines, standards, and criteria, 142 patents of invention, 9 software copyrights, and 37 sets of new treatment devices. These results were applied in 40 demonstrative engineering projects and brought about water quality improvement in the demonstrative areas. A technological framework was thus formulated for urban water pollution control.

国家“十一五”重大水专项课题

缺水城市雨污水再生处理和不同途径用水的关键技术研究与工程示范(2008ZX07317-004)

课题负责人：王晓昌

National Major Project: Technological Research and Engineering Demonstration of Wastewater/Rainwater Treatment and Reclamation for Various Reuse Purposes in Water Deficient Cities

Project Leader: Xiaochang Wang

课题针对我国缺水城市普遍存在的资源型、水质型缺水问题，以及城市水体生态水量缺失的问题，完成了不同途径回用的城市污水再生处理、城市面源控制及雨水净化与回用、回用水补水条件下的水体水质保障、缺水城市雨/污水再生利用和水环境生态保障系统等研究任务；实现了再生水为供水水源的城市水系统构建、以回用水质为约束的单元技术多级组合及城市污水分级再生处理、工程-生态技术耦合城市水体多元水质保障等理论创新；突破了物化、生化、生态有机组合与污染分级控制的关键技术，研发了生物造粒流化床污水处理设备、臭氧气浮污水再生处理设备、复合式膜生物反应器、一体化雨水净化装置等专有技术与设备；申请了10项国家发明专利，编制了3项技术指南和2项设计标准建议；结合一系列示范工程的实施，形成了缺水城市雨污水处理再生和市政、景观、工业回用和再生水质生态安全保障的技术支撑体系，为缺水城市雨污水再生处理和不同途径回用提供了应用范例。

The project aimed to solve the problems of water shortage and ecological deterioration in water deficient cities in China and conducted research work on domestic wastewater treatment and reuse for various purposes, urban non-point source control and rainwater reuse, water quality control for water bodies replenished by reclaimed water, and system optimization for water reuse and ecological safety in water deficient cities. Theoretical innovation was achieved in the formulation of urban water systems with reclaimed water as major resource, strategies for hierarchical treatment of domestic wastewater according to reuse objectives, and multiple barriers for water quality insurances coupling engineering and ecological countermeasures. The project also achieved technological innovations in the integration of physicochemical, biological, and ecological unit processes and developed several new treatment units such as fluidized pelleting bioreactor, ozone assisted flotation separator, hybrid membrane bioreactor and Integrated rainwater purification device etc. The study team applied 10 national invention patents, and proposed 3 technical guidelines and 2 design criteria. By application of these research results to a series of demonstrative projects, a technological framework was formulated to support engineering practice for safeguarding water quality to ensure water reuse for municipal, landscape, and industrial purposes.

国家“十二五”重大水专项课题

城市内湖氮磷去除及富营养化控制技术研究 (2013ZX07310-001)

课题负责人：王晓昌

National Major Project: Technological Research for Nitrogen/Phosphorus Removal and Eutrophication Control of Urban Lakes

Project Leader: Xiaochang Wang

针对我国重点流域城市在基本完成水污染控制与治理的主要任务之后，进一步改善城市水环境质量的需求，以及以城市内湖为代表的水体普遍存在氮磷等营养盐超标，导致水体功能恶化，带来环境健康隐患，严重影响城市内湖景观功能等共性问题，开展城市内湖氮磷去除及富营养化控制技术研究。以典型城市内湖为对象，研究其与城市水系统的关联及在城市水环境中的作用，提出城市内湖的水质控制基准；以水中氮磷浓度削减和不同气候特征条件下湖水藻类过度生长的抑制和景观功能保障为目标，开展湖体中氮磷的外源和内源分布特性研究，提出源头阻断和控制的策略；针对湖水中长期或季节性氮磷超标问题，研究过量总氮和总磷削减的关键技术；开展以景观功能为主的氮磷低浓度维持及湖水富营养化控制的集成技术研究，提出相关技术指南或导则，为城市水环境质量改善提供技术支撑。

The project aims to solve the problems faced by many cities in China for further improvement of the water environmental quality after engineering measures have been taken to control the major pollutant sources. In order to prevent eutrophication to occur in urban lakes due to excess nitrogen and phosphorus concentrations which often results in deteriorated water landscape, research work is to be conducted for illustrating the relationship between urban lakes and the whole urban water systems so that water quality criteria can be proposed. Other research items include nutrients source control measures, onsite reduction of excess nitrogen and phosphorus, integrated plan for sustainable control of eutrophication and improvement of water landscaping. The project will provide a technological framework to support urban water environmental improvement.

国家“十二五”重大水专项课题

（宜兴市）城市核心区水环境改善技术研究与综合示范 (2014ZX07305-002)

课题技术负责人：王晓昌

National Major Project: Technological Research and Comprehensive Demonstration of Urban Water Environmental Improvement in Yixing Central Area

Project Technical Leader: Xiaochang Wang

针对宜兴市中部城市核心区人口密度大、城市面源、管网溢流等复合源污染严重，以三沆为中心的大面积水域水质恶化等问题，以入太湖河流水质提升为目标，开展城区水环境改善技术研究，结合宜兴市河湖水系整治、污染源控制等重点工程任务，开展以水系重构、面源污染削减、水体修复和水环境改善为核心的综合工程示范，建立城市水环境监控系统，全面实现城区的水环境功能提升和生态景观系统构建，形成城市水环境改善的技术体系。

The project aims to solve the water environmental problems in the central area of Yixing City where population is concentrated and non-point source pollution and wastewater overflow result in water quality deterioration of the three lakes in series and ultimately flowing into the Taihu Lake adjacent to the city. In order to protect the Taihu Lake and meanwhile to improve the urban water environment, studies are to be conducted for water system reformation, non-point source control, restoration of urban water bodies and healthy urban water environment construction. In combination with the ongoing engineering projects in Yixing, comprehensive demonstration of integrated technologies is to be practically conducted. The project will provide a technological framework for sustainable urban water environmental management.

2012年国际水协会全球项目创新奖

再生水滋润绿色校园
——分散式零排放污水回用系统

IWA Global Project Innovation Award in 2012
Green Campus Nourished by Reclaimed Water – Decentralized System of Zero Discharge and Maximized Water Reuse

获奖项目是团队在西安思源学院校园实施的生活污水全收集、集中再生处理、再生水分级利用工程。通过常规生物处理、膜生物反应器和景观湖环境水质保障，实现了污水零排放和全回用。整个校园以3000 m^3/d的地下水供应，满足了6000 m^3/d的用水需求，用再生水营造了绿色校园。项目的重要创新点在于构建拟自然的循环水系统以提高水循环利用率。

The project is featured by a novel integration of conventional biological treatment, membrane filtration, and water quality polishing through a natural purification process in the environmental lakes. Dual-quality water reclamation is also practiced for supplying high quality and normal quality reclaimed water to meet the needs of different reuse purposes. With a maximum capacity of 3000 m^3/d of fresh water supply from groundwater wells, the total water demand of more than 6000 m^3/d has been sustained. Zero discharge of wastewater is realized and water becomes 'alive' in the local water metabolic system which provides a sound water environment and beautiful living condition in the university campus.

2012年国际水协会全球项目创新奖
IWA GLOBAL PROJECT INNOVATION AWARD IN 2012

2014年国家科技进步二等奖

水与废水强化处理的造粒混凝技术研发及其在西北缺水地区的应用

Second Class National Science and Technology Progress Award in 2014
Development of Pelleting Coagulation Technology for Enhanced Water and Wastewater Treatment and Its Application in Water Deficient Northwest Region

项目历时十余年，完成了造粒混凝理论的原始创新及造粒混凝的系列技术发明。技术应用于长庆油田4个采油区2万多个井场治理，解决了钻井泥浆处理、无害化和井场用地复耕的瓶颈问题；应用于长庆油田5个采油区的压裂废水处理与钻井回用，解决了制约采油作业效率的瓶颈问题；应用于黄河水处理，实现了沿岸企业与城镇高浊度水直接处理与污泥减量；应用于西北城市住宅开发的污水再生处理工程，实现了短流程高效低耗雨污水资源化利用。项目解决了极度缺水地区工业发展的瓶颈问题，缓解了城镇发展的供水矛盾，促进了污染治理和环境改善，带来了企业生产规模的扩大和产值的提升，直接经济效益超过23亿元。

The project lasted for more than ten years for theoretical and technological innovations. The development of pelleting coagulation theory brought about a series of technological inventions. These technologies were applied to Changqing Oilfield to treat the drilling mud from more than 20000 drilling sites and realized harmless sludge treatment and cultivated land reclamation. Fracturing wastewater from the oilfield was also treated by using the developed technology and reused for drilling operation to solve the bottleneck problem of water shortage. For industries and towns adjacent to the Yellow River, by utilizing the new technologies, direct application of the high turbidity water was made possible along with a remarkable reduction of the separated sludge. High efficiency and low energy consumption were realized in wastewater treatment and reuse in newly developed housing area. The direct economic benefits amounted to 2.3 billion RMB due to the technology innovation along with remarkable social and environmental benefits.


国家科学技术进步奖
证 书
为表彰国家科学技术进步奖获得者，特颁发此证书。
项目名称：水与废水强化处理的造粒混凝技术研发及其在西北缺水地区的应用
奖励等级：二等
获 奖 者：王晓昌
2014 年 12 月 12 日
证书号：2014-J-231-2-05-R01

2014年国家科技进步二等奖
SECOND CLASS NATIONAL SCIENCE AND TECHNOLOGY PROGRESS AWARD IN 2014

2014年陕西省科学技术一等奖

黄土塬区油气田废弃钻井液安全处置与水再生利用关键技术装备开发及应用

First Class Science and Technology Prize of Shaanxi Province in 2014
Technology and Equipment Development for Safe Disposal of Drilling Wastewater and Water Reuse in Oil & Gas Fields in Loess Plateau Area

项目以废弃钻井液安全处置和处理水再生利用为目的，开展关键技术研发，完成了物化与微生物强化废弃钻井液处理组合技术的集成创新，开发了多个系列的高效处理设备，应用于长庆油田油气开发，实现了废弃钻井液的无害化处理和分离水再生利用，在保护井场环境的同时，通过再生水补充钻井用水有效提高了油气井产能效率。技术成果应用于长庆和延长油气田的废弃钻井液安全处置与水再生利用，在有效解决井场污染问题的同时，实现了钻采过程的水资源循环利用，带来了油气田产能建设规模的扩大和产值的提升，近3年直接经济效益超过3亿元。

The project was for the safe disposal of waste drilling fluid and water reuse. The new technologies developed were featured by integration of physicochemical and microbial enhanced treatment. A series of efficient processing equipment were also developed and used in Changqing Oilfield for oil and gas development. As a result, harmless treatment of waste drilling fluid was achieved and the separated water was reused in the drilling process or for environment protection. The safe disposal of waste drilling fluid and water reuse in Changqing Oilfield effectively solved the pollution problem and meanwhile expanded the scale of oil/gas production. The net economic profit in the past 3 years amounted to 300 million RMB.


陕西省科学技术奖

证　书

为表彰陕西省科学技术奖获得者，
特颁发此证书。

项目名称：黄土塬区油气田废弃钻井液安全处置与水再生利用关键技术装备开发及应用
奖励等级：壹等
获 奖 者：王晓昌

二〇一五年二月九日

证书号：14-1-12-R3

2014年陕西省科学技术一等奖
FIRST CLASS SCIENCE AND TECHNOLOGY PRIZE OF SHAANXI PROVINCE IN 2014

2012年陕西省科学技术一等奖
缺水城市污水再生与不同途径回用关键技术研究与应用

First Class Science and Technology Prize of Shaanxi Province in 2012
Technology Development and Application for Wastewater Reclamation and Various Ruse in Water Deficient Cities

项目针对北方地区城市面临水资源短缺和环境生态脆弱的双重问题，依托陕西省13115科技创新计划工程技术研究中心项目“陕西省污水处理与资源化工程技术研究中心”的建设，结合国家自然科学基金重点项目，深入开展了理论和技术研究，完成了适合于缺水城市的污水再生与不同途径回用关键技术的研发，形成了特色鲜明的理论和技术体系，成果直接应用于10项城市污水处理与再生利用工程建设，并通过产学研结合在14项工程中得到技术推广，直接经济效益超过2亿元，成果得到国内外学术与工程界的高度评价。

The project aimed to solve the dual problems of water shortage and fragile ecological environment in northern cities of China. Supported by the key project from National Natural Science Foundation of China and "13115" S&T Innovation Project of Shaanxi Province, in-depth studies were carried out for theoretical innovation and technology development. The outputs included a series of new technologies and system design methodologies which were directly applied in 10 engineering projects for domestic wastewater treatment and reuse. Through the combination of industry, education and research, the technologies were further expanded to 14 engineering projects of similar kind. The direct economic benefits amounted to more than 200 million RMB, and the research results were highly evaluated domestically and internationally.


陕西省科学技术奖

证　书

为表彰陕西省科学技术奖获得者，
特颁发此证书。

项目名称：缺水城市污水再生与不同途径回用关键技术研究与应用
奖励等级：壹等
获 奖 者：王晓昌

二〇一二年九月十九日

证书号：2012-1-10-R1

2012年陕西省科学技术一等奖
FIRST CLASS SCIENCE AND TECHNOLOGY PRIZE
OF SHAANXI PROVINCE IN 2012

2013年陕西省科学技术二等奖

油田压裂废水多途径再生利用关键技术研究与装备开发及工程应用

Second Class Science and Technology Prize of Shaanxi Province in 2013
Technological Research, Equipment Development and Engineering Application for Oil Field Fracturing Wastewater Treatment and Ruse

项目结合油田压裂作业特征以及废水水质特点，提出了分散式工业废水的就地处理与再利用、溶解性有机物的核晶凝聚、有机污染物和发色基团的化学转化与共聚络合、高浓度悬浮物质的造粒型混凝技术等原理，研发了高效助凝剂等系列专利产品。以油田水污染控制、生态环境保护和提供油田生产作业过程中不同回用需求的再生水为目标，突破传统的污水处理、深度处理的流程界限，及物理、化学、物化、生化处理的技术界限，研发了不同单元技术融合和优化组合的一系列短流程污水再生处理新技术。项目成果在40项工程项目中得到应用，直接经济效益总值超过6亿元。

According to the characteristics of oilfield fracturing wastewater, a series of new technologies were developed for decentralized industrial wastewater treatment and reclamation, such as crystallization-coagulation, organic chromophore chemical conversion and complexing for dissolved organic removal, and pelleting coagulation for high concentration suspended solids removal. A series of high efficiency coagulants and coagulation-aids were manufactured to assist the coagulation processes. According to the purposes of treatment and water reuse, various unit processes were integrated to combine physical, chemical, physiochemical, and biochemical functions in one treatment system. The integrated technology was applied in 40 engineering projects and the direct economic benefits amounted to more than 600 million RMB.


陕西省科学技术奖

证　书

为表彰陕西省科学技术奖获得者，
特颁发此证书。

项目名称：油田压裂废水多途径再生利用关键技术研究与装备开发及工程应用
奖励等级：贰等
获 奖 者：王晓昌

二〇一三年十二月　日

证书号：13-2-32-R3

2013年陕西省科学技术二等奖
SECOND CLASS SCIENCE AND TECHNOLOGY PRIZE OF SHAANXI PROVINCE IN 2013

2009年陕西省科学技术二等奖

西部干旱缺水地区污水再生利用的理论和技术研究

Second Class Science and Technology Prize of Shaanxi Province in 2009
Theoretical and Technological Research on Wastewater Treatment and Reuse in Dry and Water Deficient Area in Western China

项目系统性地研究了缺水地区污水再生利用的理论与技术，提出了将污水再生利用与城市水环境建设相结合的新思路和新模式，建立了水资源再生利用系统模型及优化与评价方法，并应用于从小区到城市不同规模水环境系统的规划和建设。理论与技术成果已推广应用于西安国家民用航天产业基地水环境系统建设等4个省内外项目。开发的短流程、高效率的污水处理和再生利用新技术已推广应用于西安绿地世纪城仕嘉公寓“城市生态小区污水处理与再生利用”等4项实际工程，处理水质达到环境回用标准，产生了显著的社会效益、环境效益和经济效益。

Systematic studies were conducted theoretically and technologically for wastewater treatment and reuse in water deficient area. New ideas and models were proposed for combing wastewater treatment/reuse with urban water environmental construction, together with methodologies for modeling and evaluation of urban water reuse systems and their optimization. These methods were verified and practically applied through a number of systems from pilot scale to real scale. New treatment technology schemes featured by short retention time and high efficiency were developed and applied to several practical projects. The reclaimed water quality well met the standard for environmental water reuse, and remarkable socioeconomic and environmental benefits were obtained.


陕西省科学技术奖

证　书

为表彰陕西省科学技术奖获得者，特颁发此证书。

项目名称：西部干旱缺水地区污水再生利用的理论和技术研究

奖励等级：贰等

获 奖 者：王晓昌

二〇一〇年一月五日

证书号：09-2-39-R1

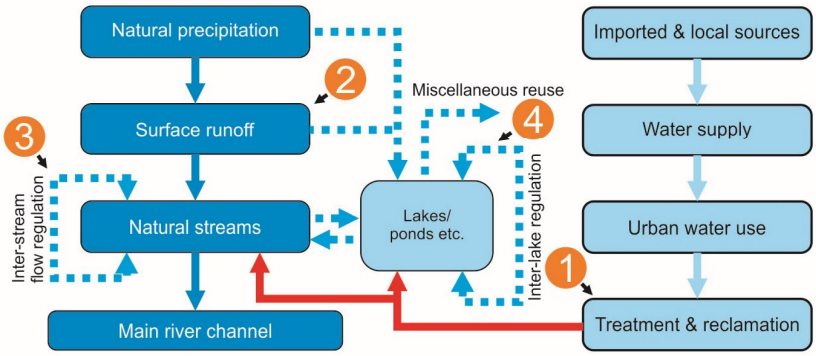
2009年陕西省科学技术二等奖
SECOND CLASS SCIENCE AND TECHNOLOGY
PRIZE OF SHAANXI PROVINCE IN 2009

基于水循环管理的“八水润西安”水资源保障

Water Cycle Management for Securing Water Resource for the “Eight-Rivers Regeneration” Project in Xi'an

西安市地处缺水地区，围绕“八水润西安”工程建设，研究团队提出了基于水循环管理，充分利用本地水资源和可再生水资源，通过多级调配利用提供湖池补水的水资源保障方案。国际水协会将此作为缺水地区水敏城市建设的典型范例。

Xi'an lies in the water deficient region. For the “Eight-Rivers Regeneration” project, the research team formulated a water cycle management plan for maximized and efficient utilization of local source and reclaimable sources, as well as escalated water uses to secure source water for replenishing urban lakes and ponds. IWA takes this project as a model case of water wise city in water deficient region.



基于水循环管理的水资源保障方案

1 –污水再生利用；2 –雨水收集利用； 3 –水体间调水；4 –多级用水

WATER SUPPLY PLAN BASED ON WATER CYCLE MANAGEMENT

1–WATER RECLAMATION AND REUSE, 2–RAINWATER HARVESTING,

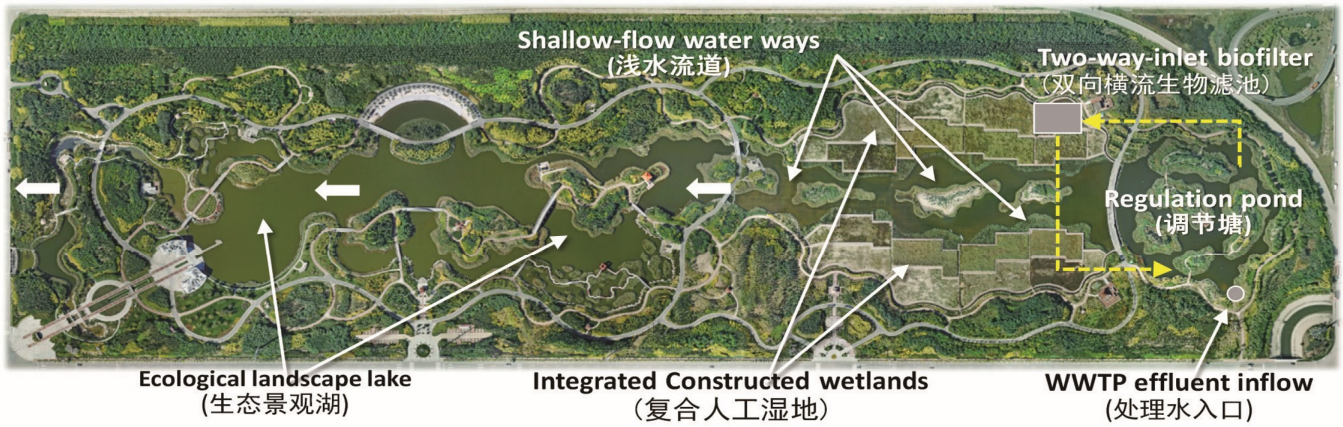
3–INTER-STREAM FLOW REGULATION, 4–ESCALATED WATER USE

污水厂尾水补水的天津临港生态湿地公园

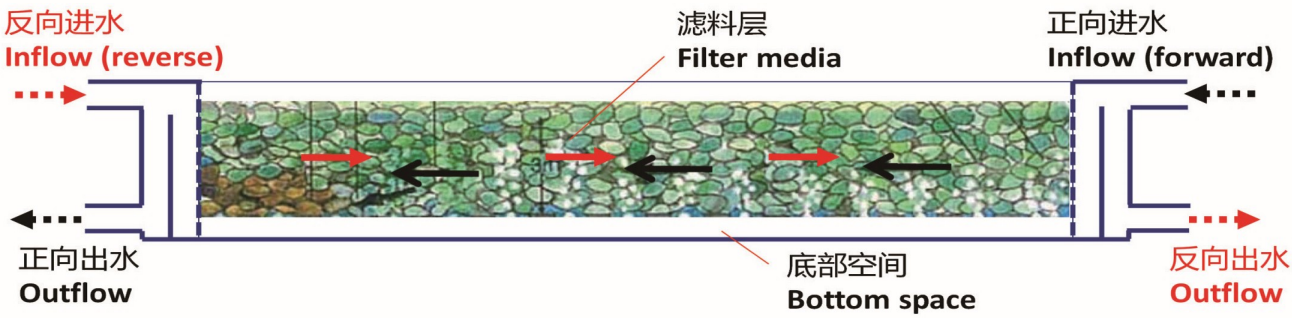
Tianjin Harbor Eco-Wetland Park with Treated Effluent as the Sole Source

天津临港生态湿地公园以污水厂二级处理水作为景观用水来源。研究团队以景观用水水质保障为目标，研发了生态强化处理技术，应用于尾水的净化处理，提供了缺水城市景观生态营造的典型范例。

An aquatic eco-landscape was implemented within the Tianjin Harbor Eco-Wetland Park for the purpose of improving the local water environmental quality. Limited by extreme water scarcity in the area, effluent from a nearby wastewater treatment plant was used as the sole source of landscape water. An Enhanced Eco-Treatment System was thus developed within the landscape park to upgrade the WWTP effluent quality to prevent eutrophication of the landscape water.



湿地公园景观（WATER LANDSCAPE IN THE ECO-WETLAND PARK）



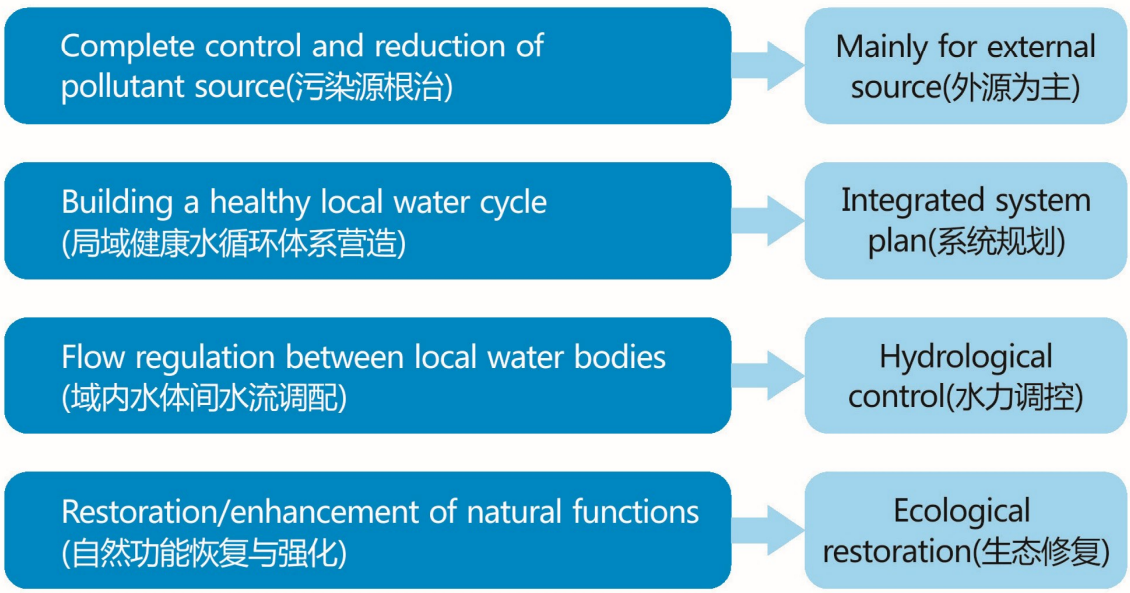
双向横流生物滤池（TWO-WAY-INLET BIOFILTER）

宜兴市水环境修复与水科技生态城建设方案

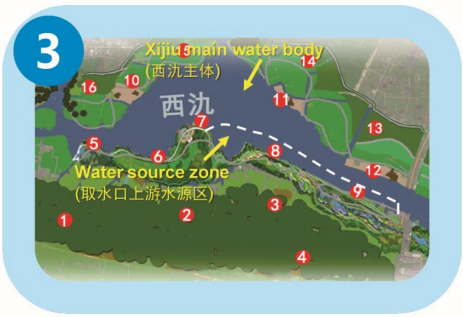
Water Environmental Restoration and Aquatic Ecocity Construction Plan

针对濒临太湖的宜兴市的水环境改善与水生态系统修复，基于水循环管理的理念，研究团队分析了宜兴市所处的流域水体特征和相互关联性，提出了宜兴市水环境修复和健康水系统构建的概念性方案，并向环科园提出了水科技生态城建设的基本构思。其要点在于，在根治污染源的基础上，科学规划城市水系统，通过流域内水力调控和生态修复，营造健康水循环体系，整体提升宜兴市的水环境承载力。

In order to improve water environmental quality and restore a healthy aquatic eco-system in Yixing, the research team analyzed the characteristics of the local watershed and relationships between different water bodies. Based on the concept of water cycle management, a conceptual framework was proposed for formulating a healthy local water cycle which further resulted in a basic plan for the construction of Yixing Water Ecological S&T City. The fundamental consideration is that along with complete control and reduction of pollutant sources, a healthy local water cycle can be built by integrated system plan associated with hydrological control between local water bodies and restoration and enhancement of natural functions in the whole watershed.



水环境修复与水科技生态城建设的技术路线
TECHNOLOGICAL ROUTE



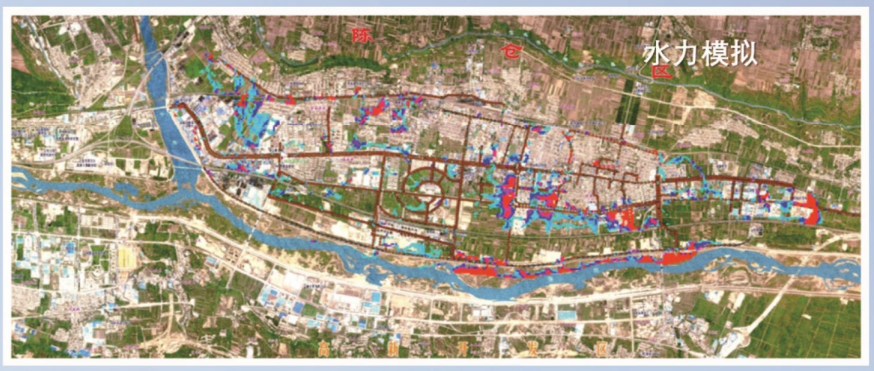
宜兴水科技生态城建设方案概要
CONSTRUCTION PLAN

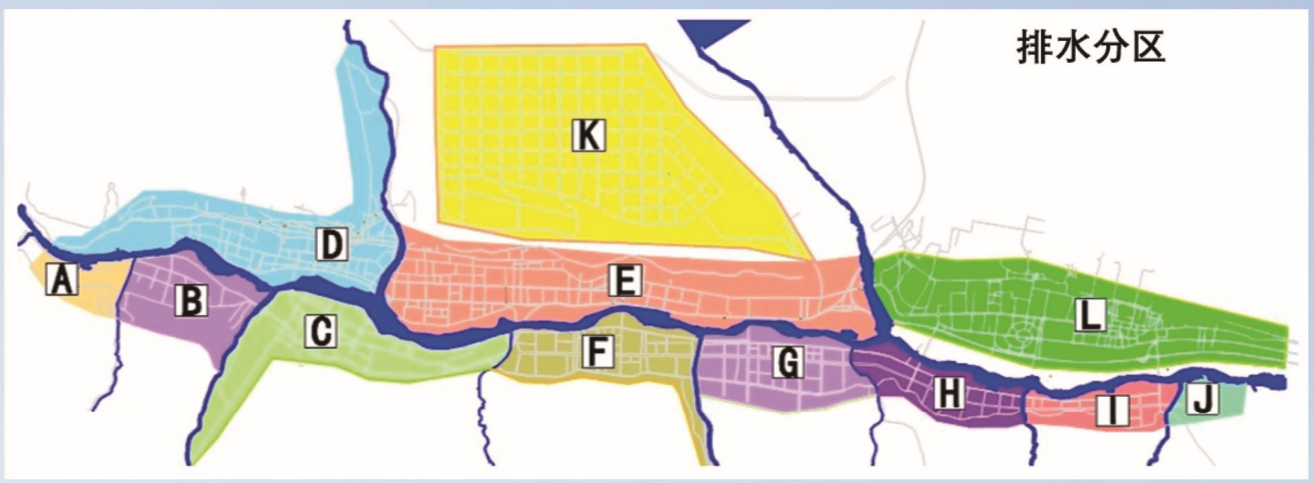
陕西省宝鸡市排水防涝综合规划

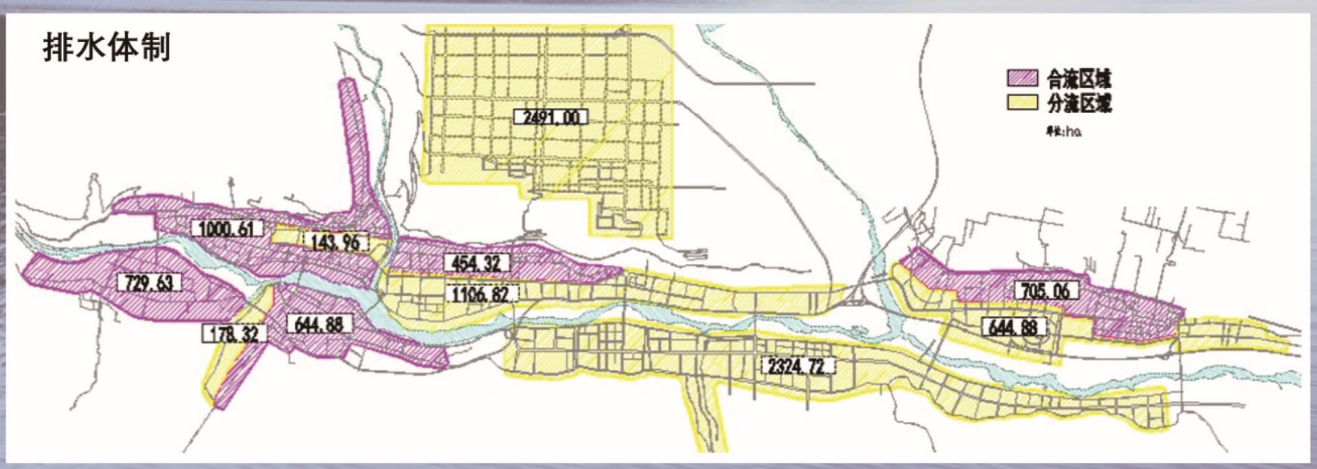
Comprehensive Plan for Urban Drainage and Flood Control for Baoji City, Shaanxi Province

受地方政府委托，研究团队承担了陕西省宝鸡市城市水环境综合治理研究和《宝鸡市城市排水（雨水）防涝综合规划》（2012–2020）编制任务，通过城市排水能力与内涝风险分析，设定了城市防涝减灾目标和内涝防治系统方案，结合西北城市水资源短缺的特点，提出了雨水径流控制与资源化利用方案，细化了排水管网规划和内涝防治工程规划，为宝鸡市的环境可持续发展提供了科学依据和技术支撑。

Requested by local government, the research team conducted a study on urban water environmental governance and compiled a comprehensive plan for urban drainage and flood control toward the target year of 2020 for Baoji City in Shaanxi Province. Based on an analysis of urban drainage capacity and risk of waterlogging, the goal of urban flood control was set and a systematic plan was formulated. According to the characteristics of water shortage in Northwest China, a plan for urban runoff control and rainwater reuse was also worked out. The countermeasures for combating urban waterlogging included drainage network enhancement and implementation of associated engineering projects. This comprehensive plan provided scientific and technological support to the city for its sustainable development.







排水防涝综合规划

COMPREHENSIVE PLAN FOR URBAN DRAINAGE AND FLOOD CONTROL

国合环境研究院
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