中国非常规水资源利用现状、问题与对策

Present Situation, Problems and Countermeasures of Unconventional Water Resource Utilization in China

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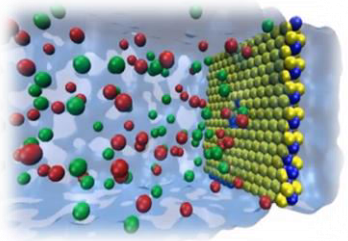
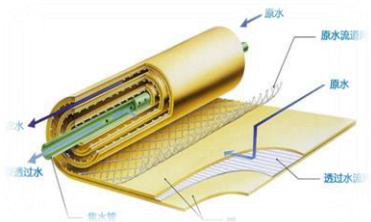




水资源本底条件Basic conditions of water resources

- 我国水系可分为：七大流域、十个片区
- China's water system can be divided into seven major watersheds and ten districts
- 河流总长42万km
- The total length of the river is 420,000 kilometers

- 流域面积100km^{2}以上河流5万多条
- More than 50,000 rivers with a drainage area of over 100km^2
- 1000km^{2}以上河流约1,500条
- About 1,500 rivers over 1000km^2

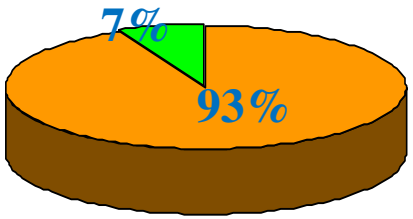
水资源本底条件Basic conditions of water resources

我国河川径流年际变化大，北方地区年最大最小径流极值比为4-7倍，一些支流可达10倍，不利于水资源的开发利用。

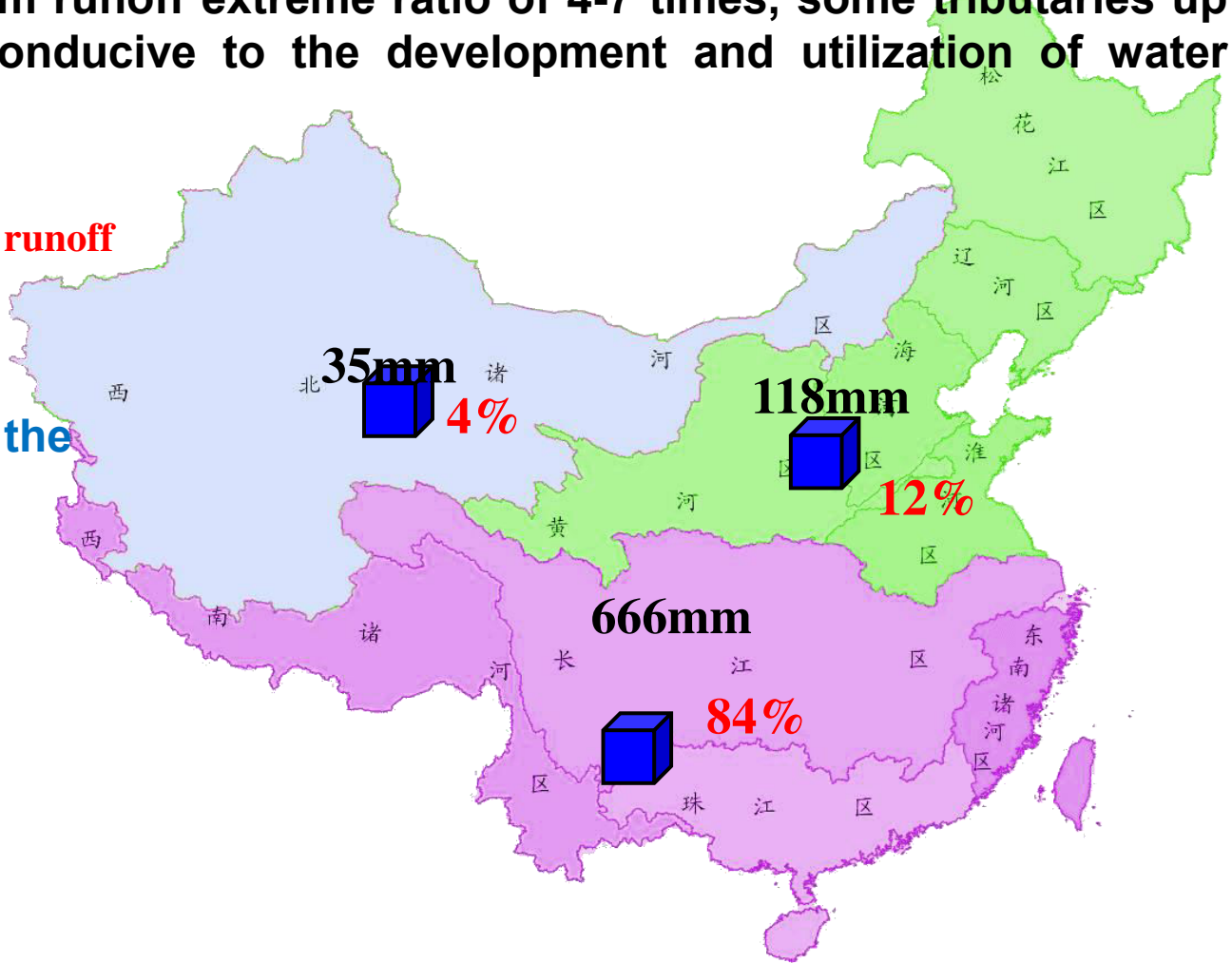
China's river runoff inter-annual variability, the northern region of the annual maximum and minimum runoff extreme ratio of 4-7 times, some tributaries up to 10 times, is not conducive to the development and utilization of water resources.

全国多年平均径流深288mm
National multi-year average runoff depth 288mm

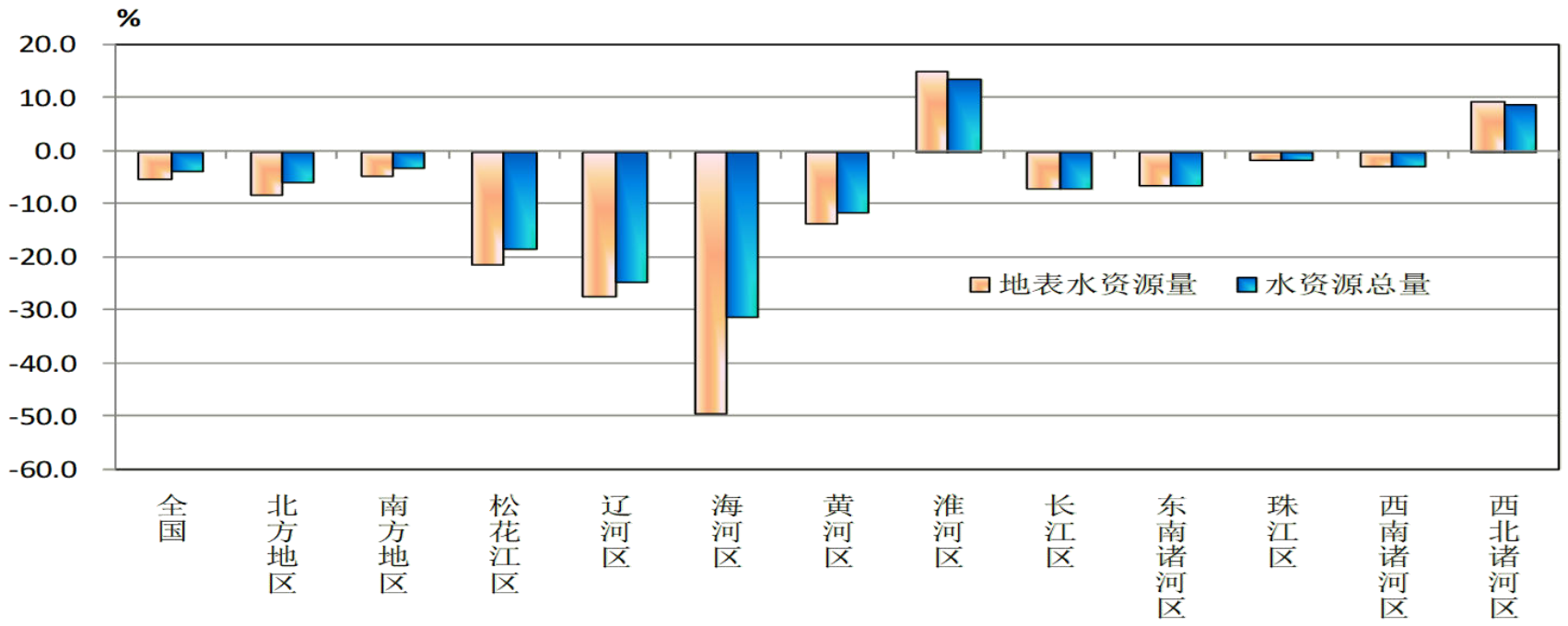
平原区年径流深75 mm
Annual runoff depth in the Plains 75 mm



山丘区年径流深371 mm
Annual runoff depth in hilly areas 371 mm



水资源本底条件Basic conditions of water resources



受气候变化和人类活动影响，近50年来我国水资源量明显减少。

2001-2010年与1956-2000年比较，降水减少2.8%，地表和水资源量分别减少5.2%和3.6%，南北方均有所减少，其中海河流域减少最为显著，降水减少9%，地表水减少49%，水资源总量减少31%。

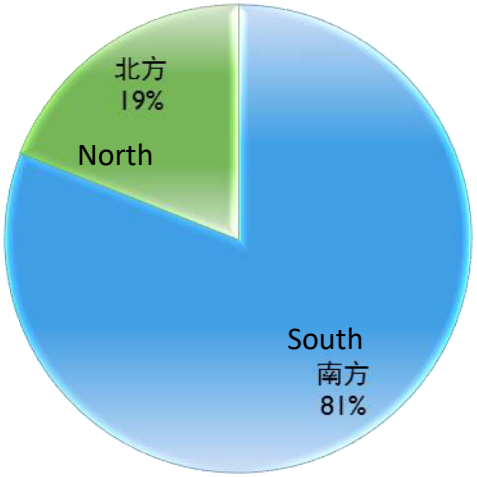
As a result of climate change and human activities, the volume of water resources in China has decreased significantly over the past 50 years.Comparing the period 2001-2010 with the period 1956-2000, precipitation decreased by **2.8%**, surface and water resources decreased by **5.2%** and **3.6%**, respectively, with decreases in both the north and the south, **with the Haihe River Basin showing the most significant decreases**, with a decrease of **9%** in precipitation, a decrease of **49%** in surface water and a decrease of **31%** in the total amount of water resources.

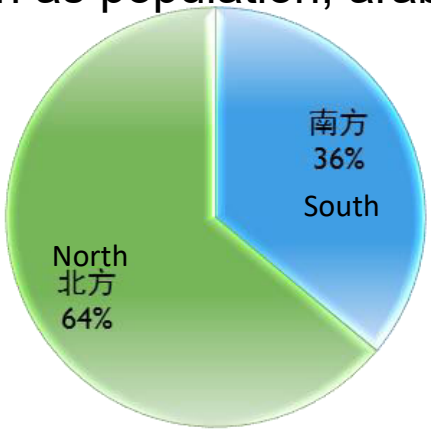
水资源本底条件Basic conditions of water resources

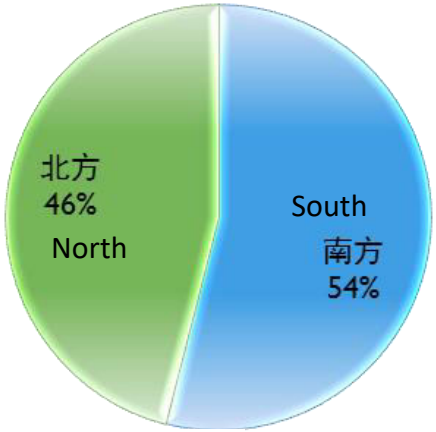
水资源空间分布与人口、耕地、矿藏资源等社会经济要素的空间分布不相匹配。

The spatial distribution of water resources does not match the spatial distribution of socio-economic factors such as population, arable land and mineral resources.

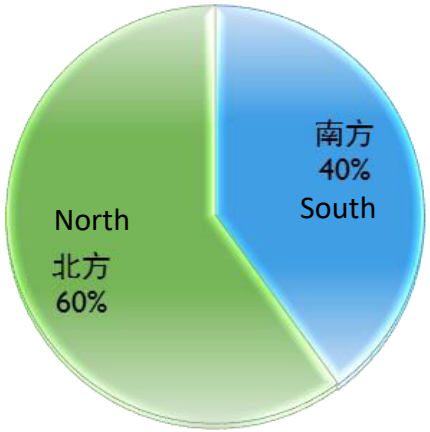
水资源
Water Resources

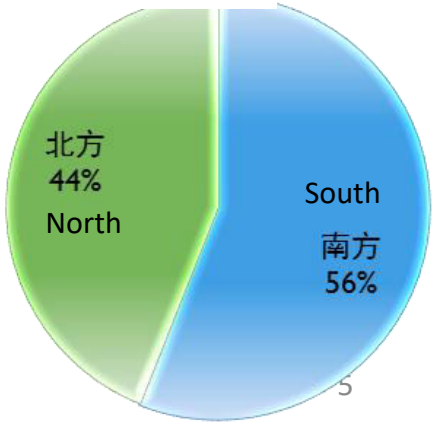






国土 land	*耕地 arable land*
人口 Population	*GDP*





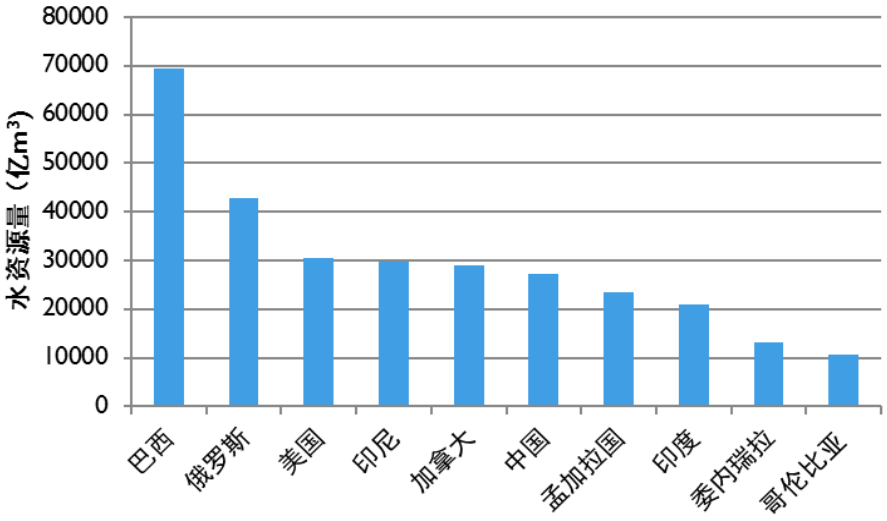
水资源本底条件Basic conditions of water resources

中国水资源条件国际比较

International Comparison of Water Resources Conditions in China

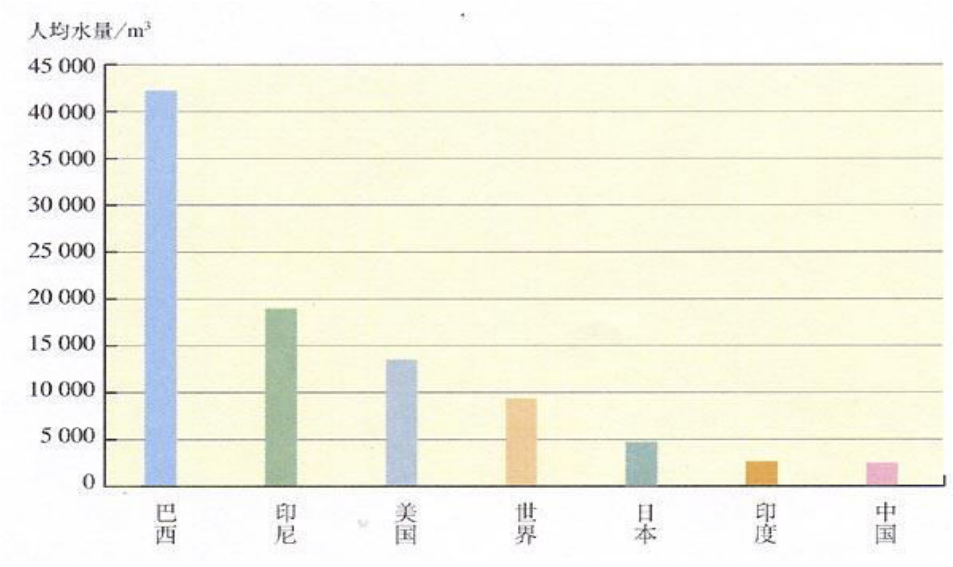
我国单位国土面积水资源量为全球平均水平的83%，人均水资源量约2100m³，不足世界人均水平的1/3。在联合国2006年对192个国家和地区评价中，位居第127位。

China's water resources per unit of land area is 83% of the global average, and the per capita water resources is about 2100m³, which is less than 1/3 of the world's per capita level.In the United Nations 2006 evaluation of 192 countries and regions, it ranked 127th.



不同国家水资源总量对比

Comparison of total water resources in different countries



世界与中国人均水资源量对比

Water resources per capita in the world versus China

水资源本底条件 Basic conditions of water resources

中国水资源自然条件评价

Evaluation of natural conditions of water resources in China

优势因素 Advantages	劣势因素 Disadvantages
水资源总量丰富 Abundance of total water resources	单位国土面积、人均、亩均水资源量少 Low water resources per unit of land area, per capita, per acre
雨热同期，利于农业生产 Rain and heat at the same time, which is good for agricultural production	年内年际分布很不均匀 Very uneven inter-annual distribution within the year
山区产水量大，利于水资源调蓄 High water production in mountainous areas facilitates water storage	南北方、东西部分布不均匀 Uneven distribution between North and South, East and West
大江大河多，利于整体调配 There are many large rivers, which facilitates overall deployment	与耕地、矿藏等经济要素分布不匹配 Mismatch with the distribution of economic factors such as arable land and mineral deposits
北方平原地区地下水赋存条件较好 Better groundwater storage conditions in the northern plains region	西南、黄河等地区水资源开发难度大 Difficulty in developing water resources in Southwest China and the Yellow River

面临的水问题 Water issues faced

水资源短缺
water shortage

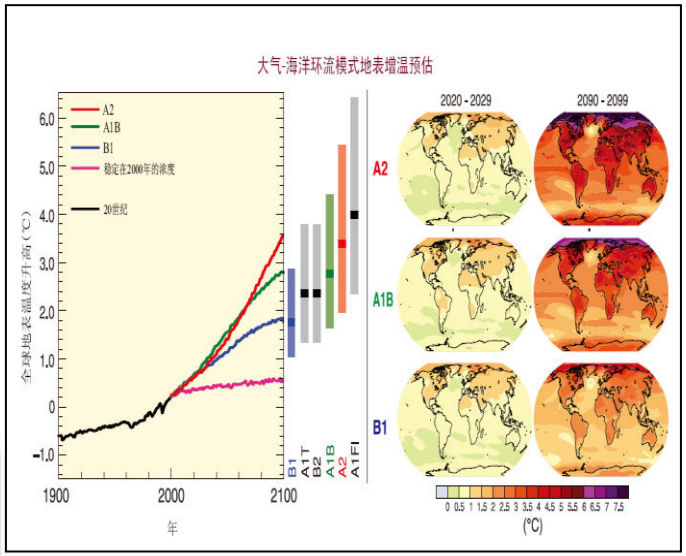
水环境污染
water pollution

水生态退化
Water ecology degradation

极端和突发事件频繁
Extreme and sudden events Frequent incidents

主要原因： 气候变化与人类活动双重影响。

Main causes: dual impacts of climate change and human activities.

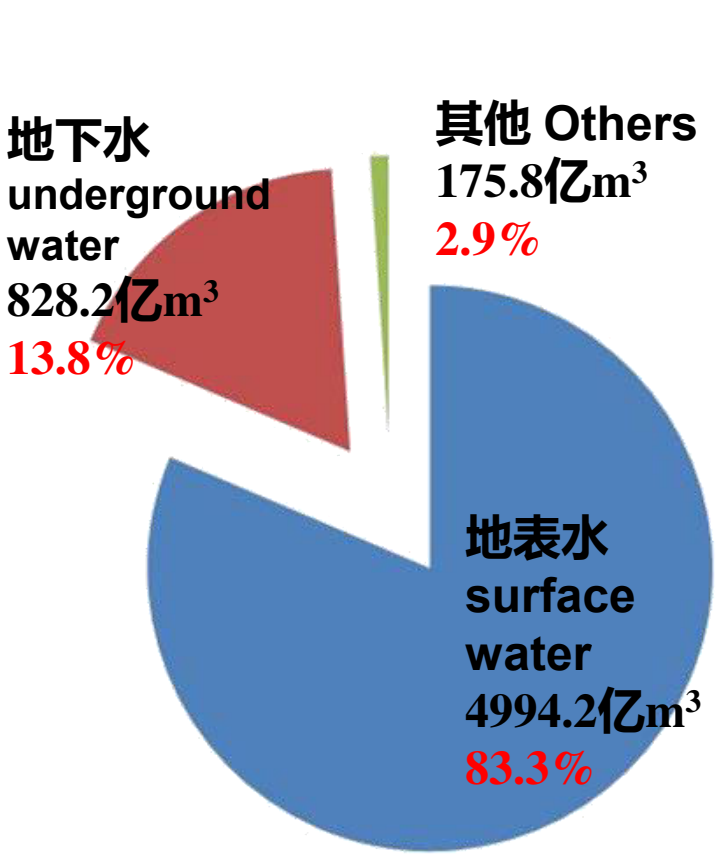


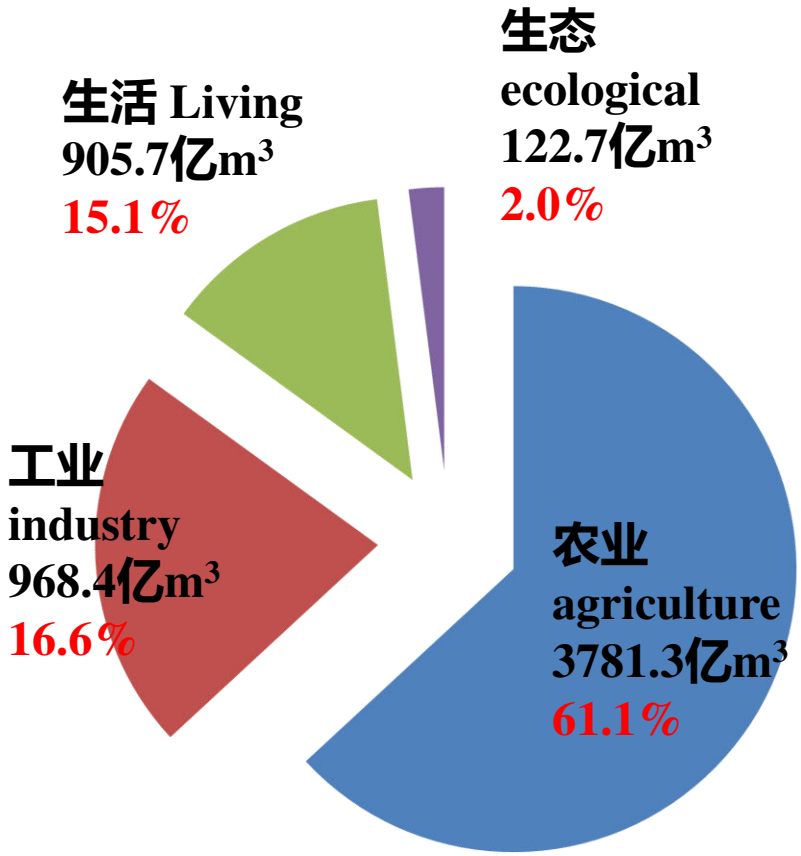
2022年非常规水资源开发利用状况

Status of non-conventional water resources development and utilization in 2022

2022年供用水总量5998.2亿m^3

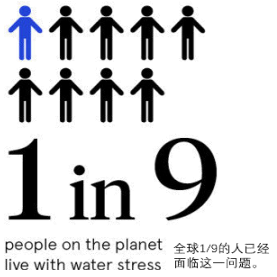
Total water supply 599.82 billion m3 in 2022





开发利用非常规水资源的意义
The significance of utilizing unconventional water resources

淡水资源短缺是全世界面临的重大挑战
The shortage of freshwater is a major challenge globally



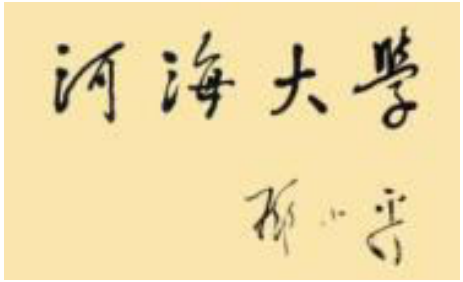
全球1/9的人严重缺水
1/9 of the world's population is severely lacking in water

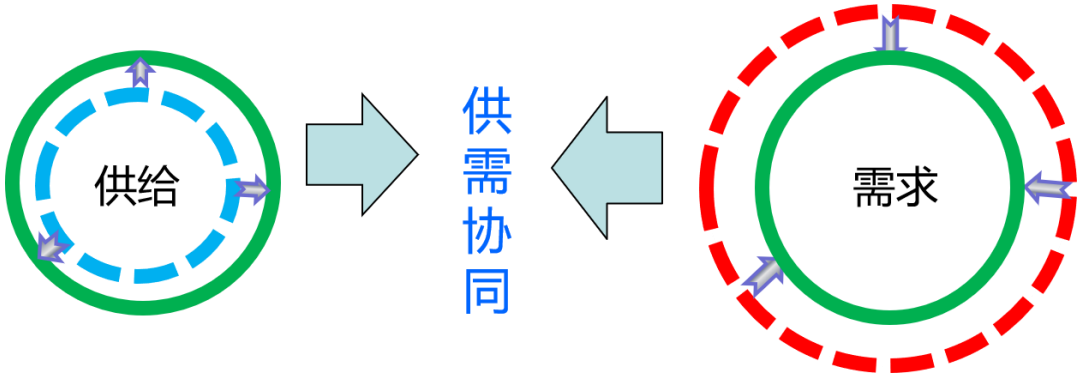
到2050年，全球将有一半人面临用水危机
By 2050, half of the world's population will face a water crisis

中国：世界平均水平的1/4

日本：季节性缺水问题突出

2020年全球人均水资源分布图
Global per capita water resource distribution map in 2020

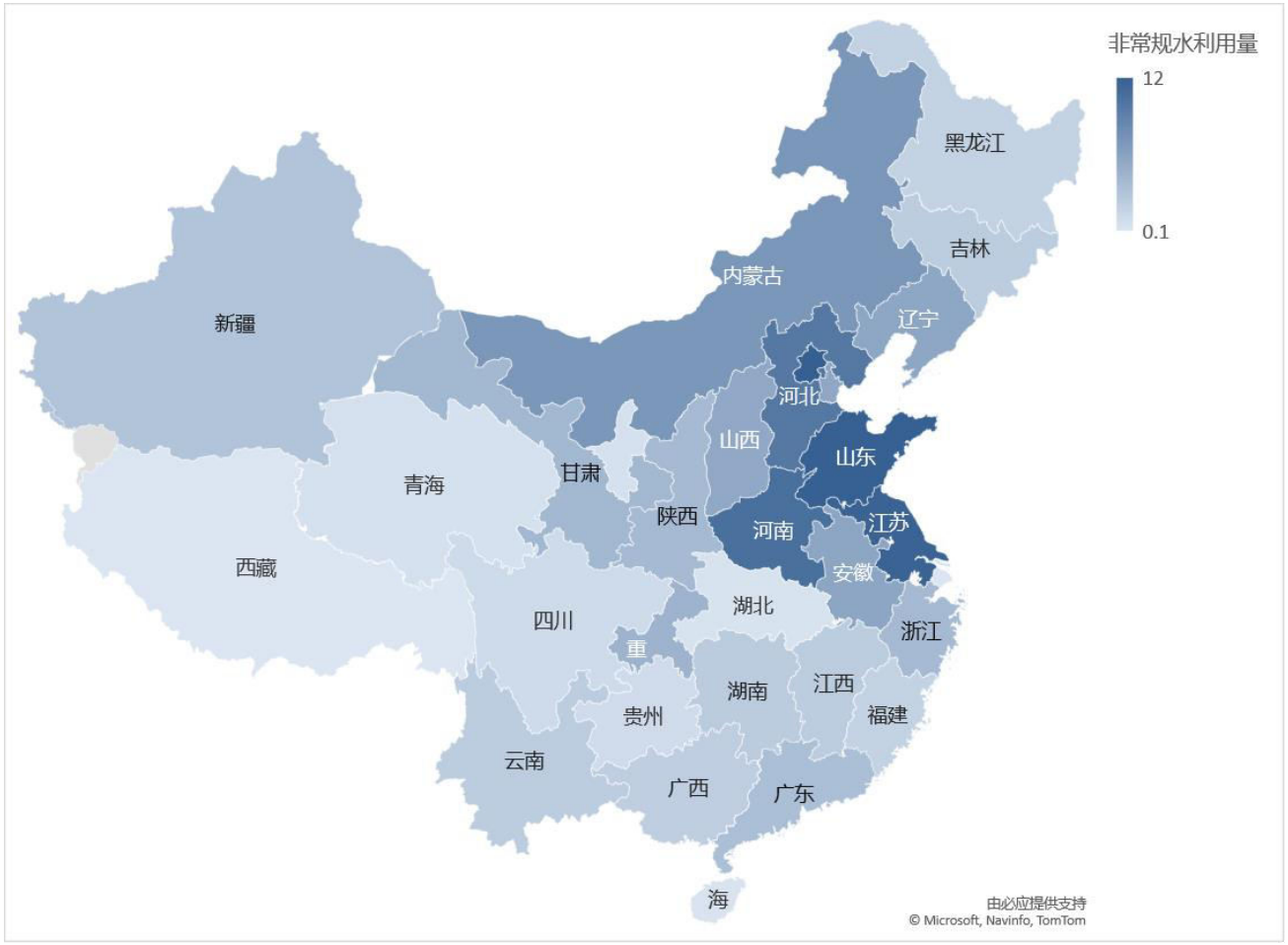




开发利用非常规水资源的意义
The significance of utilizing unconventional water resources

2022中国各省(自治区、直辖市) 非常规水资源开发利用量分布

Distribution of unconventional water resource utilization in various provinces (autonomous regions, municipalities) of China in 2022



关于加强非常规水源配置利用的指导意见
Guiding Opinions on Strengthening the Allocation and Utilization of Unconventional Water Sources

- 水利部，国家发改委2023年6月发布了《关于加强非常规水源配置利用的指导意见》指出非常规水资源是经处理后可以利用或在一定条件下可直接利用的再生水、集蓄雨水、海水及海水淡化水、矿坑(井)水、微咸水等。开发利用非常规水源具有增加供水、减少排污、优化水资源配置体系、提高水资源利用效率等重要作用，是高质量发展的内在要求。目前，我国非常规水源利用尚存在配置水平偏低、利用不够充分、政策不够健全、认识不够到位等问题。

- The Ministry of Water Resources of People Republic of China the "Guiding Opinions on Strengthening the Allocation and Utilization of Unconventional Water Sources" in June 2023, which pointed out that unconventional water resources are recycled water, rainwater harvesting, seawater and desalination water, mine (well) water, brackish water, etc. that can be used after treatment or directly under certain conditions. The development and utilization of unconventional water sources plays an important role in increasing water supply, reducing pollution discharge, optimizing water resource allocation system, and improving water resource utilization efficiency. It is an inherent requirement for high-quality development. At present, there are still problems with the utilization of unconventional water sources in China, such as low allocation level, insufficient utilization, inadequate policies, and inadequate understanding.

指导思想Guiding ideology

- 坚持习近平总书记“节水优先、空间均衡、系统治理、**两手**发力”**治水思路**，统筹考虑各地区水资源禀赋、**承**载能力与发展需求，坚持将非常规水源纳入水资**源**统一配置，以强化配置管理、促进配置利用、加强能力建设、健全体制机制为抓手，着力扩大非常规水源利用领域和规模，提升水资源集约节约利用**水平**，为缓解水资源供需矛盾、提升水安全保障能**力提供有力支撑**。

- Adhere to the concept our President Xi “Prioritizing water conservation, balancing spatial distribution, taking systematic approaches, and giving full play to the roles of both government and market.” we will comprehensively consider the water resource endowment, carrying capacity, and development needs of various regions, adhere to incorporating unconventional water sources into the unified allocation of water resources, and focus on strengthening allocation management, promoting allocation and utilization, strengthening capacity building, and improving institutional mechanisms. We will strive to expand the scope and scale of unconventional water source utilization, enhance the level of intensive and economical water resource utilization, and provide strong support for alleviating the supply-demand contradiction of water resources and enhancing water security guarantee capabilities.

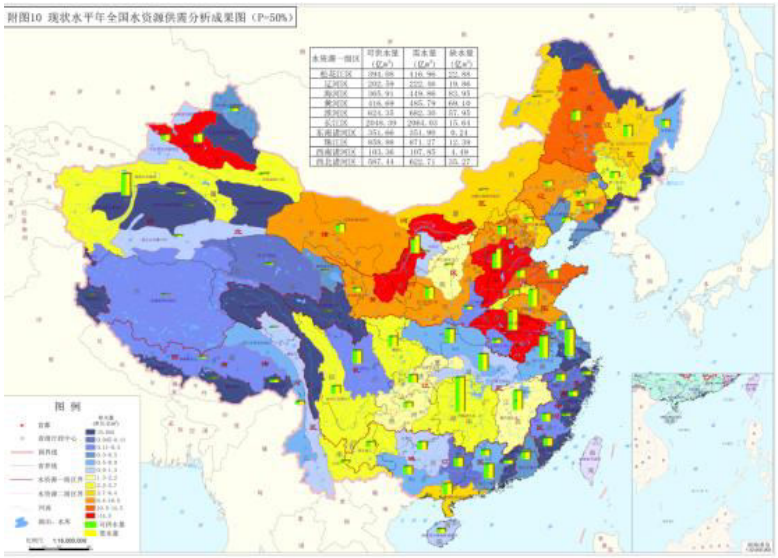
科学规划与合理布局 Scientific planning and reasonable layout

- 编制流域综合规划、水资源综合规划等水利综合规划时，应当科学制定水资源配置方案，**将非常**规水源纳入水资源供需平衡分析与配**置体系**。编制节约用水规划、非常规水源利**用**规划等水利专业规划时，应充分考虑非常规水源的用水需求、供水能力和设施布局，**明确非常**规水源最低配置量、配置对象及水**源**类型，统筹推进非常规水源配置利用设施**建**设和提质改造。规划相关内容不符合要求**的**，**水行政主管部**门不得同意其通过审查。

- When formulating comprehensive water conservancy plans such as watershed planning and water resource planning, water resource allocation plans should be scientifically formulated, and unconventional water sources should be included in the analysis and allocation system of water resource supply and demand balance. When formulating water conservation plans, unconventional water source utilization plans, and other water conservancy professional plans, full consideration should be given to the water demand, water supply capacity, and facility layout of unconventional water sources. The minimum allocation amount, allocation objects, and water source types of unconventional water sources should be clearly defined, and the construction and upgrading of unconventional water source allocation and utilization facilities should be coordinated and promoted. If the relevant content of the plan does not meet the requirements, the water administrative department shall not approve it for review.

目标与管理Objectives and Management

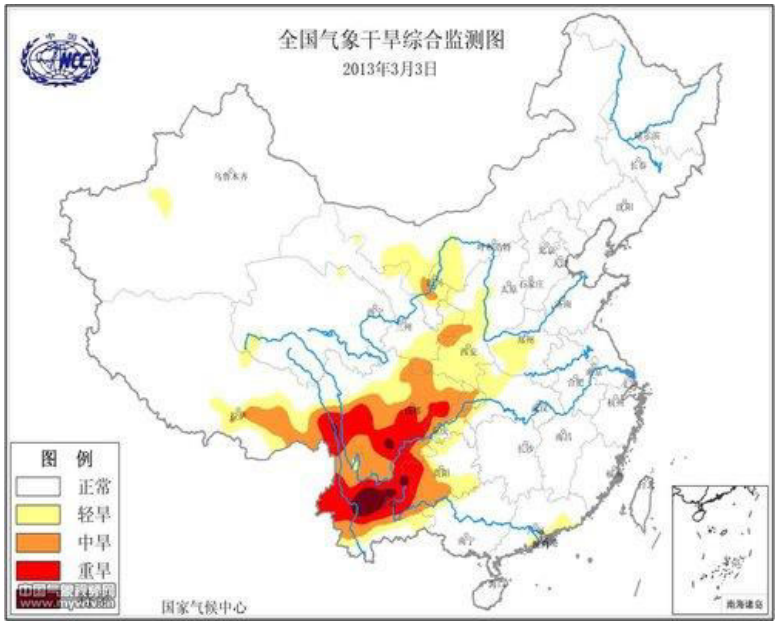
- 实行目标管理。将非常规水源利用量纳入用水总量和强度双控指标体系，按年度把全国非常规水源利用量控制目标分解配置到各省(**自治区、直**辖市)，**各省(自治区、直**辖市)结合实际进一**步分解配置到市、**县级行政区，有条件的地区进一步分解到水源类型及重点行业。



- Implement target management. Incorporate the utilization of unconventional water sources into the dual control index system of total water use and intensity, and decompose and allocate the national unconventional water source utilization control objectives to each province (autonomous region, municipality) on an annual basis. Each province (autonomous region, municipality) further decomposes and allocates them to city and county-level administrative regions based on actual conditions, and further decomposes them to water source types and key industries in areas with conditions.。

将非常规水资源纳入用水计划
Incorporating unconventional water resources into water use plans

- **将非常**规水源合理纳入计划用水管理，**核定年度用水**计划时，对于具备利用非**常**规水源条件的用水户配置非常规水源。**下达的用水**计划应当明确非常规水源计**划用水指**标，对常规水源实行超定额超计划加征水资源税(费)**或加价。按**计划**可以利用非常**规水源而未利用的，核减**其下一年度常**规水源的计划用水指标。



- Reasonably incorporate unconventional water sources into planned water management, and when approving annual water use plans, allocate unconventional water sources for water users who have the conditions to utilize unconventional water sources. The issued water use plan should clarify the water use indicators for unconventional water sources, and impose water resource taxes (fees) or price increases on conventional water sources that exceed the quota and plan. If unconventional water sources can be utilized but are not utilized according to the plan, the planned water use indicators for the next year's conventional water sources will be reduced.

引导市场配置Guide market allocation

- **推**动落实减免水资源税(费)、**企**业所得**税等税**费优惠政策，降低非常规水源生产和使用成本，逐步消除非常规水源与**外**调水、地表水、地下水的价格劣势。**培育壮大非常**规水源交易市场，鼓励交**易双方依据市**场化原则自主协商定价，**增**强相关经营主体开发利用非常规水源**的内生**动力。

- Promote the implementation of preferential policies such as reducing water resource taxes (fees) and corporate income tax, reduce the production and use costs of unconventional water sources, and gradually eliminate the price disadvantage between unconventional water sources and external water sources, surface water, and groundwater. Cultivate and strengthen the unconventional water source trading market, encourage both trading parties to independently negotiate pricing based on market-oriented principles, and enhance the endogenous power of relevant business entities to develop and utilize unconventional water sources.

再生水配置利用

Regenerated water allocation and utilization

- 统筹将再生水用于工业生产、城市杂用、生态环境、农业灌溉等领域，稳步推进典型地区再生水利用配置试点。以缺水地区、水资源超载地区为重点，将再生水作为工业生产用水的重要水源，推行再生水厂与企业间“点对点”配置，推进企业内部废污水循环利用，支持工业园区废水集中处理及再生利用；河湖湿地生态补水、造林绿化、景观环境用水、城市杂用等，在满足水质要求条件下，优先配置再生水；有条件的缺水地区，按照农田灌溉用水水质标准要求，稳妥推动再生水用于农业灌溉。

- We will coordinate the use of recycled water for industrial production, urban miscellaneous use, ecological environment, agricultural irrigation, and other fields, and steadily promote pilot projects for the allocation of recycled water in typical areas. Focusing on areas with water scarcity and water resource overload, we will use recycled water as an important source of industrial production water, promote "point-to-point" configuration between recycled water plants and enterprises, promote the internal recycling of wastewater and support the centralized treatment and recycling of wastewater in industrial parks; Priority should be given to the allocation of recycled water for ecological water replenishment, afforestation and greening, landscape and environmental water use, and urban miscellaneous use in river and lake wetlands, while meeting water quality requirements; In water deficient areas with conditions, in accordance with the water quality standards for farmland irrigation, we will steadily promote the use of recycled water for agricultural irrigation.

集蓄雨水Collecting and storing rainwater

- **集蓄雨水。**结合海绵城市建设，因地制宜提升**公园、**绿地、建筑、道路、广场等雨水资源综**合利用水平。西北、**华北缺水山区，西南岩溶**地区以及沿海地区和海**岛，结合地形地貌建设**水池、水窖、坑塘等工程收集、**处理雨水。水质型缺水地区，结合治污减排，积极推进雨污**分流和雨水收集利用。因地制宜推广**农业集雨节水灌溉技术，用于农业补充灌溉。

- Collect and store rainwater. Combining with the construction of sponge cities, we will improve the comprehensive utilization level of rainwater resources such as parks, green spaces, buildings, roads, squares, etc. according to local conditions. Water deficient mountainous areas in the northwest and north China, karst areas in the southwest, coastal areas, and islands, combined with the terrain and topography, should be constructed to collect and treat rainwater through projects such as ponds, water cellars, and pits. In water quality deficient areas, in combination with pollution control and emission reduction, actively promote the diversion of rainwater and sewage and the collection and utilization of rainwater. Promote agricultural rainwater harvesting and water-saving irrigation technology according to local conditions for supplementary irrigation in agriculture.

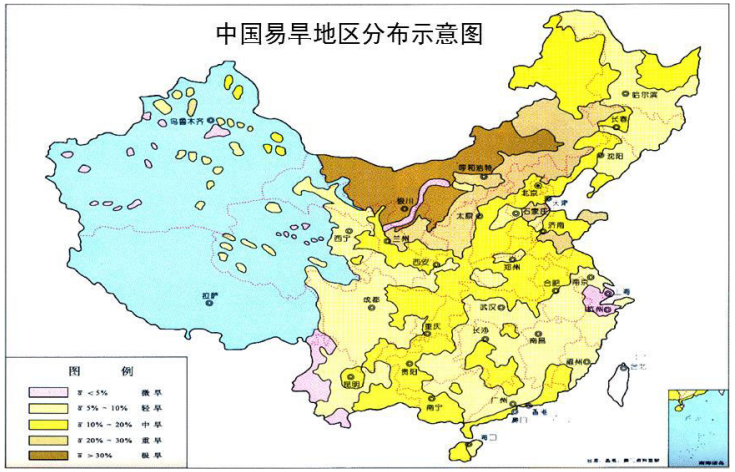
海水 Sea Water

- **把海水作**为沿海水资源的重要补充和战略储备，**加**强海水直接利用。沿海火电、核电及石化、**化工**、钢铁等重点用水行业在技术成熟的基础**上推广海水作**为冷却用水，鼓励脱硫、冲洗类**工**艺环节用水优先利用海水。支持沿海海域滩**涂和**盐渍化地区科学发展海水增养殖业和海水**灌**溉农业，推广海水源热泵技术。探索在消除**含海水**废污水对生态环境影响前提下，城市市**政、消防、冲**厕等领域直接利用海水。

- Make seawater an important supplement and strategic reserve for coastal water resources, and strengthen the direct utilization of seawater. Coastal thermal power, nuclear power, petrochemical, chemical, steel and other key water consuming industries promote seawater as cooling water on the basis of mature technology, and encourage the priority use of seawater in desulfurization and flushing processes. We will support the scientific development of seawater aquaculture and seawater irrigated agriculture in mudflat and saline areas in coastal waters, and promote seawater source heat pump technology. Exploring the direct utilization of seawater in areas such as municipal administration, firefighting, and toilet flushing, while eliminating the impact of seawater containing wastewater on the ecological environment.

海水淡化水 Sea Water Desalination

- **沿海缺水地区要加**强海水淡化水利用，因地制宜将**海水淡化水作**为生活补充水源、市政新增供水及应**急**备用水源，进一步提高海水淡化水配置量和覆盖**范**围，提升城市供水安全保障水平。对沿海地区工业园区和高耗水产业应科学配置海水淡化水，扩大**工**业园区海水淡化水利用规模，建设海水淡化水利**用示范工**业园区，依法严控具备条件但未充分利用**海水淡化水的高耗水**项目和工业园区新增取水许可。



- Coastal areas with water scarcity should strengthen the utilization of seawater desalination water, and use seawater desalination water as a supplementary source of water for daily use, newly added municipal water supply, and emergency backup water source according to local conditions. This will further increase the allocation and coverage of seawater desalination water, and enhance the level of urban water supply security. For industrial parks and high water consuming industries in coastal areas, seawater desalination water should be scientifically allocated, the scale of seawater desalination water utilization in industrial parks should be expanded, demonstration industrial parks for seawater desalination water utilization should be built, and high water consuming projects that meet the conditions but do not fully utilize seawater desalination water and new water intake permits for industrial parks should be strictly controlled in accordance with the law.

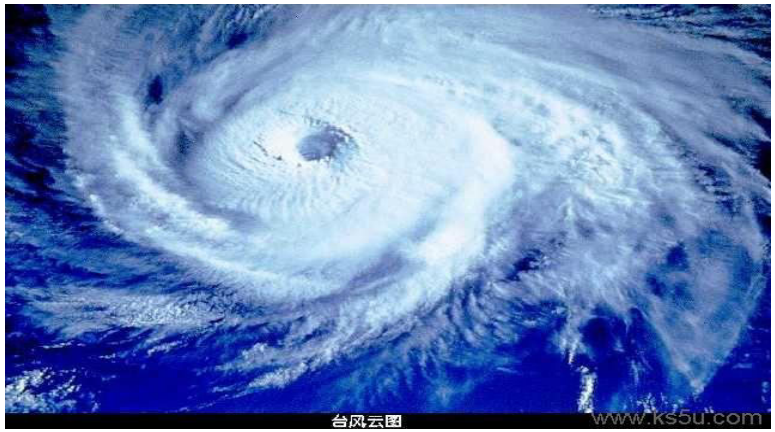
矿坑(井)水 Mine (well) Water

- 矿坑(井)水。西北、华北、两淮、云贵等煤矿矿坑涌水量丰富的地区，应统筹加强矿坑(井)水利用。矿区生产应充分使用矿坑(井)水。对于周边具备矿坑(井)水供水条件且水质满足利用要求的工业企业，在办理取水许可时应合理配置矿坑(井)水。具备条件地区在矿坑(井)水水质符合农田灌溉水质标准前提下，可推广用于农业灌溉。

- Mine (well) water. In areas with abundant water inflow from coal mines such as the Northwest, North China, Huaihe and Yungui regions, it is necessary to coordinate and strengthen the use of water resources in mining pits (wells). Mining area production should make full use of pit (well) water. For industrial enterprises with mine (well) water supply conditions and water quality that meets utilization requirements in the surrounding area, reasonable allocation of mine (well) water should be made when obtaining water intake permits. Under the premise that the water quality of mining pits (wells) in areas with conditions meets the water quality standards for agricultural irrigation, they can be promoted for agricultural irrigation.

微咸水 Brackish Water

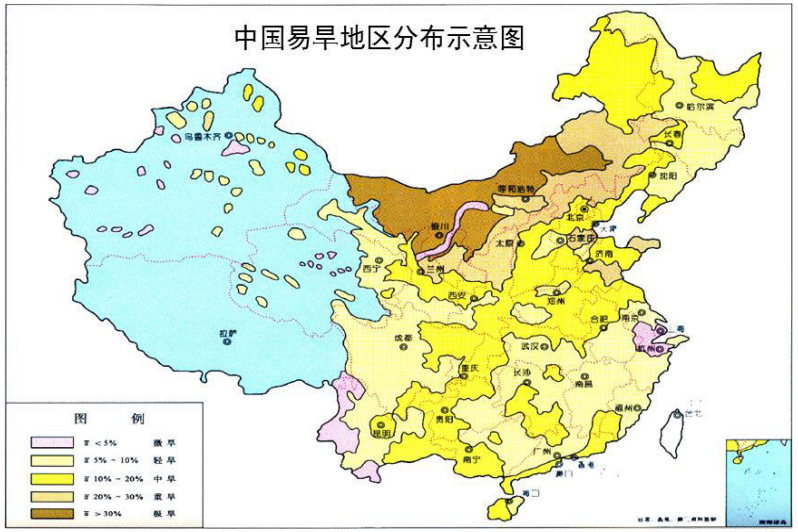
- 西北及沿海地区等微咸水丰富的缺水地区，在不影响生态环境安全、不造成土壤盐碱化的前提下，稳妥发展咸淡混灌、咸淡轮灌等微咸水灌溉利用模式，因地制宜推广种植耐盐碱作物品种。在农村供水水源不足地区，可因地制宜加强微咸水淡化处理利用，作为生产、生活供水的补充水源。



- In areas with abundant brackish water shortage such as the northwest and coastal areas, while not affecting ecological environment safety and causing soil salinization, we will steadily develop brackish water irrigation and utilization models such as mixed irrigation and rotation irrigation, and promote the cultivation of salt alkali tolerant crop varieties according to local conditions. In areas with insufficient water supply sources in rural areas, desalination and utilization of brackish water can be strengthened according to local conditions, as a supplementary source of water for production and daily life.

提升科技支撑能力
Enhance technological support capabilities

- **提升科技支撑能力。加**强再生水、海水及海水淡**化水等非常**规水源开发利用关键技术科研攻关，**支持新技**术、新工艺、新材料、新设备的研究开发，推动先进实用技术设备集成、示范和应用。**鼓励引**导建立非常规水源开发利用产业技术创新联盟，推动跨领域跨行业协同创新。



- Enhance technological support capabilities. Strengthen the research and development of key technologies for the development and utilization of unconventional water sources such as recycled water, seawater, and seawater desalination water, support the research and development of new technologies, processes, materials, and equipment, and promote the integration, demonstration, and application of advanced practical technology and equipment. Encourage and guide the establishment of unconventional water source development and utilization industry technology innovation alliances, and promote cross disciplinary and cross industry collaborative innovation.

2000-2020年非常规水源利用与全国供水总量对比
Comparison of unconventional water source utilization and total national water supply 2000 - 2020

2025年，全国非常规水源利用量超过170亿立方米比2020年提高33%

In 2025, the utilization of unconventional water sources in China exceeded 17 billion cubic meters, increase of 33% compared to 2020

- 今年3月份，水利部、国家发展改革委联合发布《关于印发“十四五”用水总量和强度双控目标的通知》（以下简称《通知》），明确了各省、自治区、直辖市“十四五”用水总量和强度双控目标。《通知》首次将非常规水源最低利用量作为控制目标分解下达到各省、自治区、直辖市，确保到2025年，全国非常规水源利用量超过170亿立方米，预计比2020年增加33%，对促进非常规水源开发利用，缓解水资源供需矛盾具有重要意义。

- In March of this year, the Ministry of Water Resources and the National Development and Reform Commission jointly issued the "Notice on Issuing the Double Control Objectives for Total Water Use and Intensity during the 14th Five Year Plan" (hereinafter referred to as the "Notice"), clarifying the dual control objectives for total water use and intensity during the 14th Five Year Plan for each province, autonomous region, and municipality directly under the central government. The "Notice" decomposes the minimum utilization of unconventional water sources as the control goal for the first time to reach various provinces, autonomous regions, and municipalities directly under the central government, ensuring that by 2025, the utilization of unconventional water sources in China will exceed 17 billion cubic meters, an expected increase of 33% compared to 2020. This is of great significance for promoting the development and utilization of unconventional water sources and alleviating the contradiction between water supply and demand.

2025年各省、自治区、直辖市用水总量和强度双控目标：非常规水源利用量

Target for total and intensity of water use in various provinces, autonomous regions, and municipalities in 2025: utilization of unconventional water sources

行政区	用水总量（亿立方米）	其中：非常规水源利用量（亿立方米）	万元国内生产总值用水量比 2020 年下降（%）	万元工业增加值用水量比 2020 年下降（%）	农田灌溉水有效利用系数
北京	42.5	12.0	10.0	10.0	0.753
天津	35.0	6.4	10.0	10.0	0.725
河北	206.0	14.2	15.0	13.0	0.678
山西	85.0	6.0	12.0	10.0	0.580
内蒙古	196.3	7.4	12.0	13.0	0.579
辽宁	140.0	6.3	14.0	12.0	0.593
吉林	137.3	3.4	16.0	13.0	0.610
黑龙江	363.3	2.0	12.0	13.0	0.613
上海	112.0	0.2	16.0	16.0	0.740
江苏	620.0	15.2	17.0	19.0	0.625
浙江	186.8	5.2	16.0	18.0	0.615
安徽	306.0	7.0	18.0	18.0	0.580
福建	189.9	2.2	20.0	18.0	0.574
江西	262.3	3.7	20.0	18.0	0.527
山东	241.1	15.0	16.0	10.0	0.651
河南	260.7	12.4	16.0	10.0	0.629
湖北	318.0	4.0	16.0	16.0	0.545
湖南	334.5	3.0	17.0	12.0	0.570
广东	435.0	5.0	16.0	10.0	0.535
广西	301.0	3.6	16.0	16.0	0.524
海南	53.0	0.4	18.0	12.0	0.580
重庆	79.9	5.0	15.0	15.0	0.515
四川	270.0	6.1	16.0	16.0	0.505
贵州	117.0	1.2	16.0	20.0	0.503
云南	177.0	4.1	20.0	16.0	0.520
西藏	37.1	0.2	19.0	16.0	0.463
陕西	107.0	5.0	12.0	10.0	0.585
甘肃	120.9	5.2	13.0	10.0	0.590
青海	29.6	1.2	10.0	10.0	0.510
宁夏	72.8	2.0	15.0	10.0	0.590
新疆	563.0	5.4	20.0	12.0	0.585
全国	6400	170	16.0	16.0	0.580

河海大学非常规水中心发展定位
Development of Hohai University's unconventional water center

非常规水源 Un-Conventional Water Resources

非常规水源，也称为非常规水资源、非传统水源、非传统水资源、边缘水、替代水源或其他水源等。非常规水资源是相对于常规水源而言提出的，区别于传统意义上易于开发利用的地表水和地下水，是指在常规条件下不易开发利用，但随着科学技术进步可通过新的技术、工艺、方法和管理措施获得，并具有特殊的水量水质特性和开发利用方式的水资源赋存形式。

——水利大百科修订词条

Unconventional water sources, also known as unconventional water resources, non-traditional water sources, non-traditional water resources, marginal water sources, alternative water sources, or other water sources. Unconventional water resources are proposed relative to conventional water sources, which are different from surface water and groundwater that are traditionally easy to develop and utilize. They refer to water resources that are not easy to develop and utilize under conventional conditions, but can be obtained through new technologies, processes, methods, and management measures with scientific and technological progress, and have special water quantity and quality characteristics and development and utilization methods.

——Revised entries in the Encyclopedia of Water Resources

苦咸水淡化 Brackish Water Desalination

再生水利用 reclaimed water reuse

海水淡化 Sea Water Desalination

雨水集蓄利用 rainwater harvesting and utilization

矿井水 熔隙水 Mine Water Gap Water

发展定位-中心任务
Development positioning - Task of the center

围绕非常规水资源开发利用中的重大问题
Major issues surrounding the development and utilization of unconventional water resources

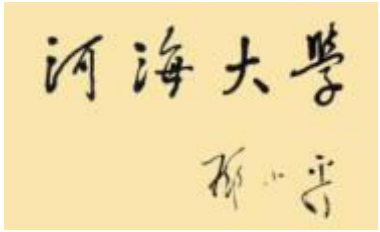
◆技术咨询服务
◆Technical consulting services
◆工程化示范
◆Engineering demonstration

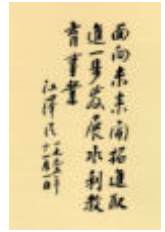
- 加强海水及其他非常规水资源开发利用领域的科研创新，推进学科的交叉融合、促进产学研合作、加强国际交流，提升科技服务社会的能力
- Strengthen scientific research and innovation in the development and utilization of seawater and other unconventional water resources, promote interdisciplinary integration, promote industry university research cooperation, strengthen international exchanges, and enhance the ability of science and technology to serve society

依托单位情况-河海大学
Supporting units - Hohai University

- 我国第一所培养水利人才的高等学府
- The first higher education institution in China to cultivate water conservancy talents
- 水利学科全国排名第一,水利工程、环境科学与工程为一流建设学科
- The discipline of water conservancy ranks first in the country, and water conservancy engineering, environmental science and engineering are first-class construction disciplines
- 为国家输送20余万水利专门人才
- Delivering over 200000 water conservancy professionals to the country

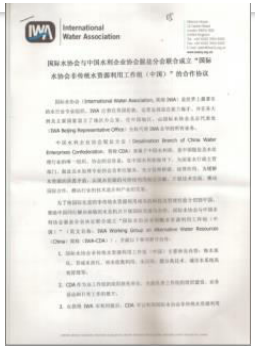
新安江水文预报模型　入选建国40周年的50项重大成果之一





邓小平亲笔题写校名　江泽民题词

江苏省净水设备制造行业协会



国际水协会非传统水资源利用工作组（中国）

温总理寄语“献身、求实、负责”

研发团队学科带头人Research and development team discipline leader

郭有智，男，教授，河海大学海水淡化与非常规水资源开发利用研究中心主任，IWA国际水协会非常规水源专委会秘书长。40多年来致力于脱盐、膜与水处理技术及行业管理和发展的研究，协助政府制定相关产业战略和决策，是膜领域国家973项目专家评审及科技部、环保部膜领域专家，主持参与国家部委等各级研究项目20余项。

Guo Youzhi, male, professor, director of the Research Center for Seawater Desalination and Unconventional Water Resource Development and Utilization at Hohai University, and Secretary General of the IWA International Water Association's Unconventional Water Source Committee. For over 40 years, I have been committed to research on desalination, membrane and water treatment technologies, as well as industry management and development. I have assisted the government in formulating relevant industry strategies and decisions. I have been an expert in the national 973 project in the field of membranes, as well as an expert in the field of membranes from the Ministry of Science and Technology and the Ministry of Environmental Protection. I have led and participated in over 20 research projects at various levels, including national ministries and commissions.

平台建设情况-人才团队
Platform Construction - Talent Team

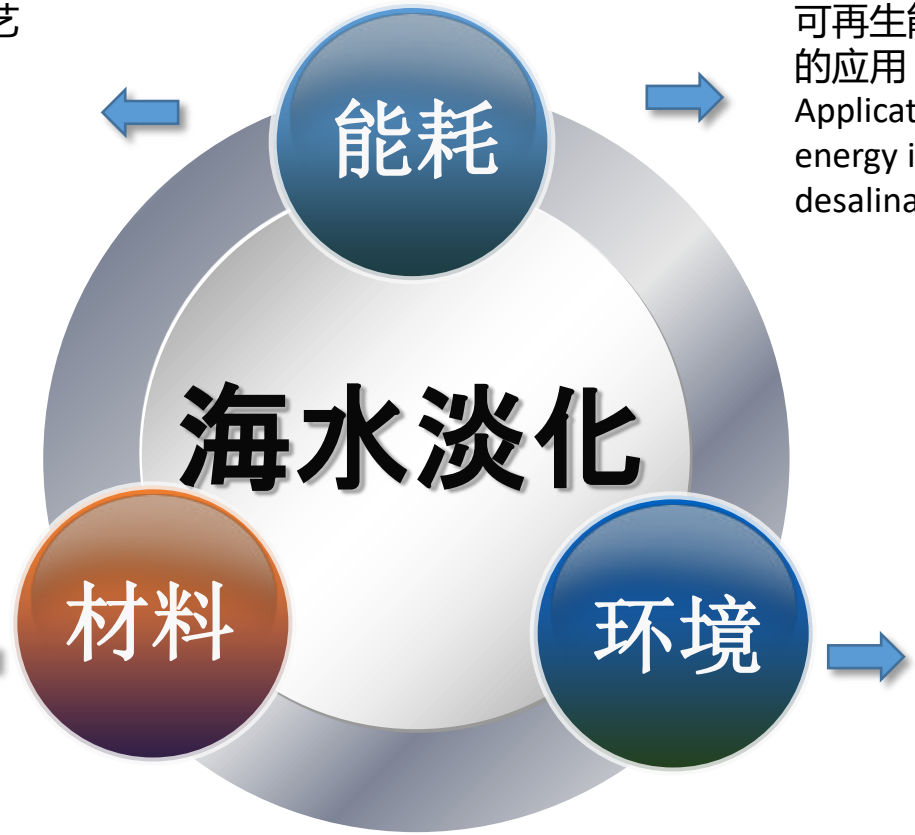
中心围绕海水、再生水、苦咸水、雨水等非常规水源的开发利用技术，新材料、新能源在非常规水源开发中的应用以及非常规水源利用工程系统性能优化等方向，组建了32人的创新服务团队，其中兼职人员8人，专职人员21人，客座人员4人。拥有高级职称21人，中级职称6人，博士学历24人，硕士学历5人。

The center has established an innovative service team of 32 people focusing on the development and utilization technology of unconventional water sources such as seawater, recycled water, brackish water, and rainwater, as well as the application of new materials and energy in the development of unconventional water sources, as well as the optimization of the performance of unconventional water source utilization engineering systems. Among them, there are 8 part-time personnel, 21 full-time personnel, and 4 guest personnel. There are 21 individuals with senior professional titles, 6 individuals with intermediate professional titles, 24 individuals with doctoral degrees, and 5 individuals with master's degrees.

课题项目 Projects

主要围绕非常规水资源中的海水及再生水的开发及利用开展研究
Mainly focusing on the development and utilization of seawater and recycled water in unconventional water resources

集成海水淡化技术及工艺耦合与优化
Integrated seawater desalination technology and process coupling and optimization



可再生能源在海水淡化中的应用
Application of renewable energy in seawater desalination

新一代反渗透膜材料，延长膜的使用寿命
The new generation of reverse osmosis membrane materials extends the service life of the membrane

浓盐水（地下卤水）净化与浓缩技术，结合制盐工艺。
Purification and concentration technology of concentrated brine (underground brine), combined with salt production process.

课题项目 Projects

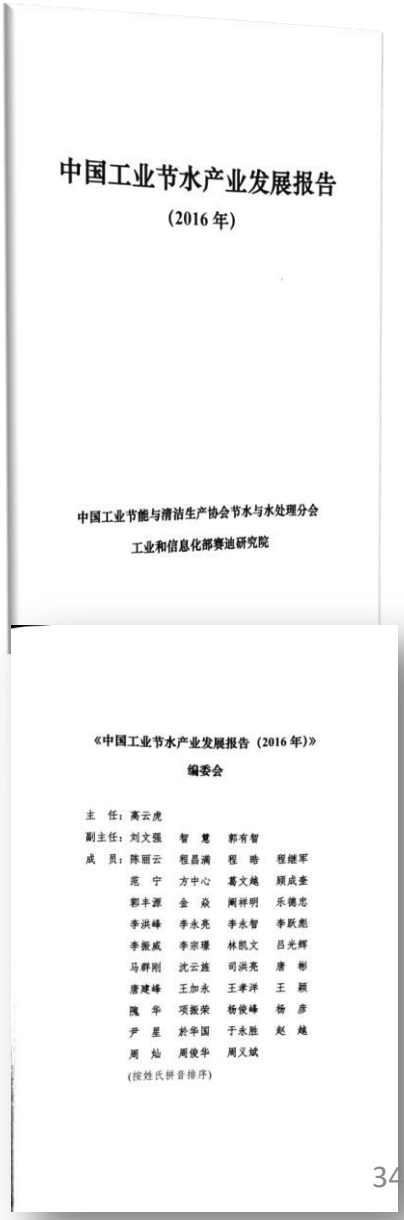
再生水利用
Reclaimed water reuse

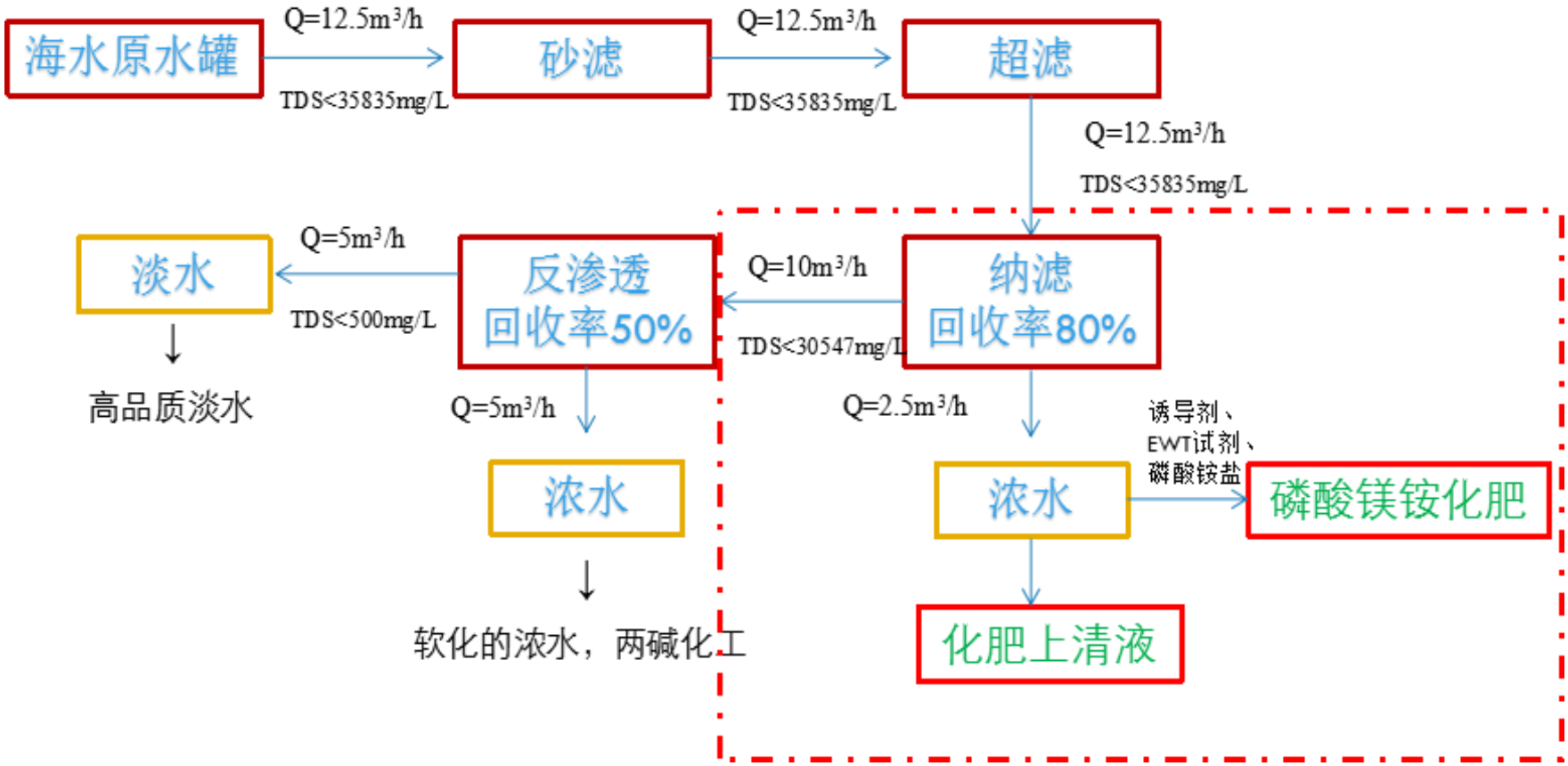
市政污水回用研究
Research on Municipal Wastewater Reuse

- 再生水回用技术研究
- Research on Reuse Technology of Regenerated Water
- 再生水利用配置研究
- Research on the allocation of renewable water resource

工业废水回用研究
Research on the Reuse of Industrial Wastewater

- 高难度工业废水处理与回用技术研究
- Research on the Treatment and Reuse Technology of High Difficulty Industrial Wastewater
- 高盐度工业废水零排放技术研究
- Research on Zero Discharge Technology of High Salinity Industrial Wastewater





海水淡化集成工艺-浓海水综合利用系统流程图

Flow chart of integrated seawater desalination process - concentrated seawater comprehensive utilization system

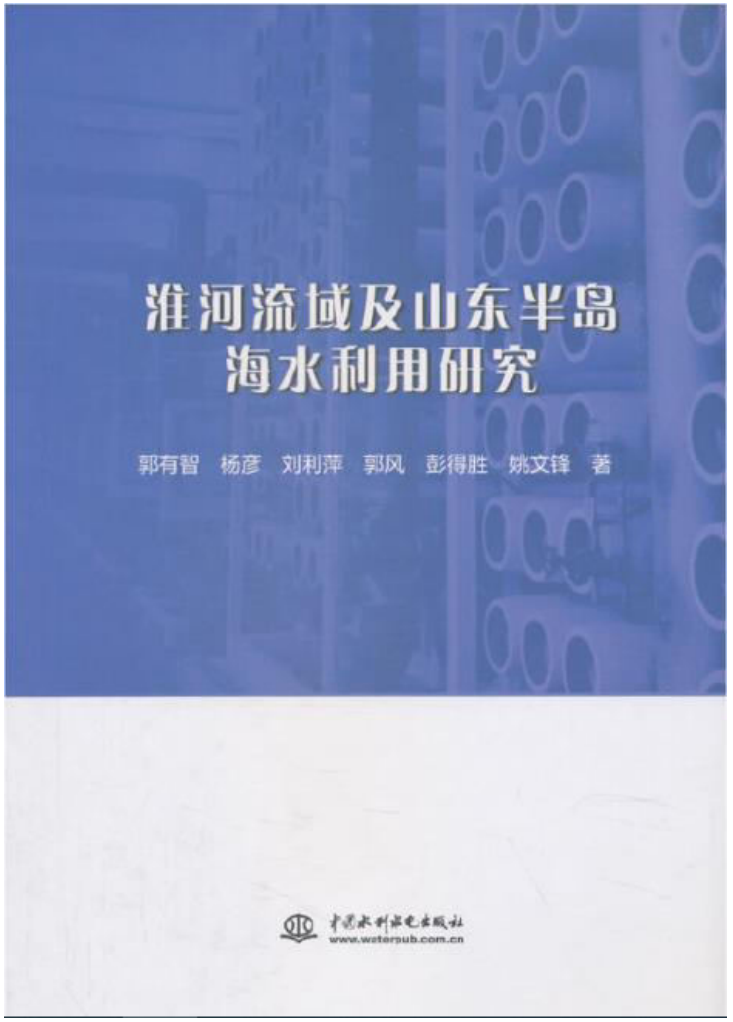
围绕海水淡化集成工艺及综合利用技术研究

Research on integrated processes and comprehensive utilization technologies for seawater desalinatior

- 沿海缺水城市海水淡化成套技术与示范推广一期
- Complete Set of Seawater Desalination Technologies and Demonstration Promotion Phase I in Coastal Water Shortage Cities
- 沿海缺水城市海水淡化成套技术与示范推广二期
- Complete Set of Seawater Desalination Technologies and Demonstration Promotion Phase II in Coastal Water Shortage Cities
- 沿海缺水城市海水淡化成套技术与示范推广三期
- Complete Set of Seawater Desalination Technologies and Demonstration Promotion Phase III in Coastal Water Shortage Cities
- 淮河流域及山东半岛非常规水源利用
- Unconventional water source utilization in the Huaihe River Basin and Shandong Peninsula
- 华能威海发电有限责任公司二期海水淡化系统改造可行性研究
- Feasibility Study on the Transformation of Phase II Seawater Desalination System of Huaneng Weihai Power Generation Co., Ltd
- 淮河流域海水利用状况调查及利用潜力分析
- Investigation and Potential Analysis of Seawater Utilization in the Huaihe River
- 离网型波浪能反渗透海水淡化系统关键技术研究
- Research on Key Technologies of Off grid Wave Energy Reverse Osmosis Seawater Desalination System
- 风电海水淡化系统及设备建模测试
- Modeling and testing of wind power seawater desalination system and equipment

◆水利部农林水利经费项目—《淮河流域及山东半岛非常规水源利用》(2017~2019)

◆Ministry of Water Resources Agriculture, Forestry and Water Resources Funding Project -"Unconventional Water Source Utilization in the Huai River Basin and Shandong Peninsula" (2017-2019)



- 浓海水综合利用技术创新基地建设方案及可行性研究
- Construction Plan and Feasibility Study of Innovation Base for Comprehensive Utilization of Concentrated Seawater Technology
- 浓海水综合利用产业化前期技术研究与开发
- Research and development of early industrialization technology for comprehensive utilization of concentrated sea water
- 浓盐水处理技术咨询
- Consultation on concentrated brine treatment technology
- **山东省盐业集团“浓海水综合利用技术创新基地”建设方案及可行性研究报告（2014）**
- **Construction Plan and Feasibility Study Report of Shandong Salt Industry Group's "Concentrated Seawater Comprehensive Utilization Technology Innovation Base" (2014)**

◆ 工艺探索-增浓中试实验

◆ Process Exploration - Concentration Pilot Experiment

- **反渗透增浓试验装置。**
- **Reverse osmosis concentration test device.**
- **正渗透增浓试验装置。**
- **Reverse osmosis concentration test device.**
- **电渗析增浓试验装置。**
- Reverse osmosis concentration test device.

- **山东盐业——浓海水综合利用产业化前期技术研究与开发**
- **Shandong Salt Industry - Research and Development of Early Industrialization Technology for Comprehensive Utilization of Concentrated Seawater**

反渗透海水淡化系统
Reverse osmosis seawater desalination system

膜蒸馏系统
Membrane distillation system

纳滤系统
Nanofiltration System

高压反渗透系统
High pressure RO system

- 山东盐业-纳滤精制卤水精制盐生产工业化示范项目可行性研究（2018）
- Feasibility Study on Shandong Salt Industry - Nanofiltration Refined Brine Refined Salt Production Industrialization Demonstration Project (2018)

替代现有钡法除硫酸根化学工艺，取代了氯化钡（剧毒）加药和杜绝了后续硫酸钡对环境的污染，实现了清洁生产，具有重要的现实意义。基于中试研究结果编制的3万吨/年药用盐工程化实施方案表明：吨盐制造成本可下降80元左右，投资回收期小于1.5年，经济和环境效益显著。

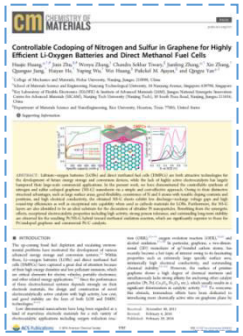
Replacing the existing barium method for sulfate removal chemical process, replacing the addition of barium chloride (highly toxic) and eliminating the subsequent pollution of barium sulfate to the environment, achieving clean production, has important practical significance. The engineering implementation plan for 30000 tons/year of medicinal salt based on the results of pilot studies shows that the manufacturing cost of each ton of salt can be reduced by about 80 yuan, the investment payback period is less than 1.5 years, and the economic and environmental benefits are significant.

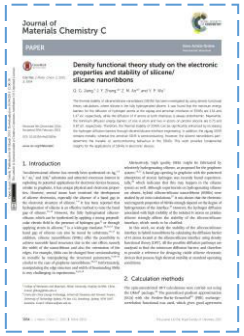
风能及波浪能与海水淡化工艺耦合

Coupling of Wind and Wave Energy with Seawater Desalination Process

- ✓ 变工况风电海水淡化仿真系统开发
- ✓ Development of a simulation system for wind power seawater desalination under variable operating conditions
- ✓ 离网型波浪能反渗透海水淡化系统关键技术研究
- ✓ **Research on Key Technologies of Off grid Wave Energy Reverse Osmosis Seawater Desalination System**

- **借助反渗透膜表面接枝改性、界面聚合**过程中加入添加剂或者共溶剂等化学改性方法提升抗污性能；
- By utilizing chemical modification methods such as surface grafting modification of reverse osmosis membranes and adding additives or co solvents during interfacial polymerization, the anti fouling performance can be improved;
- **研究不同聚合**单体聚合反应，改进反渗透复合膜性能；
- Study the polymerization reactions of different monomers and improve the performance of reverse osmosis composite membranes;
- **探**讨二维碳化钛、石墨烯、碳纳米管等新型材料的水传递行为及其对反渗透膜性能的影响规律，**推**进其产业化应用进程。
- Explore the water transfer behavior of new materials such as two-dimensional titanium carbide, graphene, and carbon nanotubes and their impact on the performance of reverse osmosis membranes, and promote their industrial application process.





典型工业废水的膜分离技术集成研究

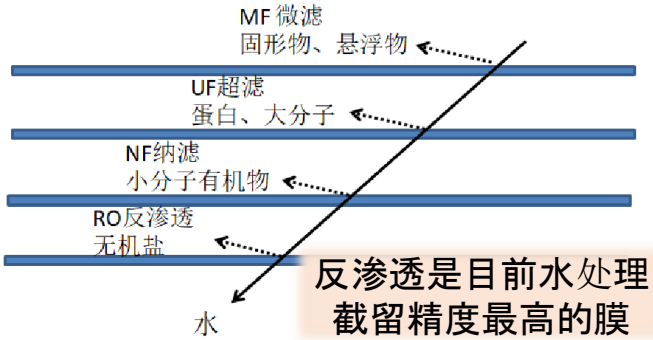
Integrated Study on Membrane Separation Technology for Typical Industrial Wastewater

以印染、造纸、煤化工等高耗水行业的典型工业废水为对象，通过对原水的测试与分析，以及调研相关数据给出典型废水的组成和特征污染物，设计合理的膜分离集成工艺，建立中试装置，给出优化的集成工艺参数，构建出集成过程工艺包，实现节水治污目的。

Taking typical industrial wastewater from high water consumption industries such as printing and dyeing, papermaking, and coal chemical industry as the object, the composition and characteristic pollutants of typical wastewater are given through testing and analysis of raw water, as well as research on relevant data. A reasonable membrane separation integrated process is designed, a pilot plant is established, optimized integrated process parameters are provided, and an integrated process process package is constructed to achieve water-saving and pollution control purposes.

纳滤、反渗透膜材料
NF,RO Membrane Material

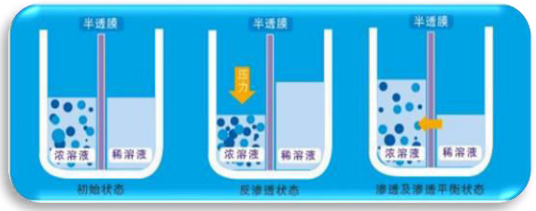
反渗透膜
RO Membrane



反渗透是目前水处理截留精度最高的膜

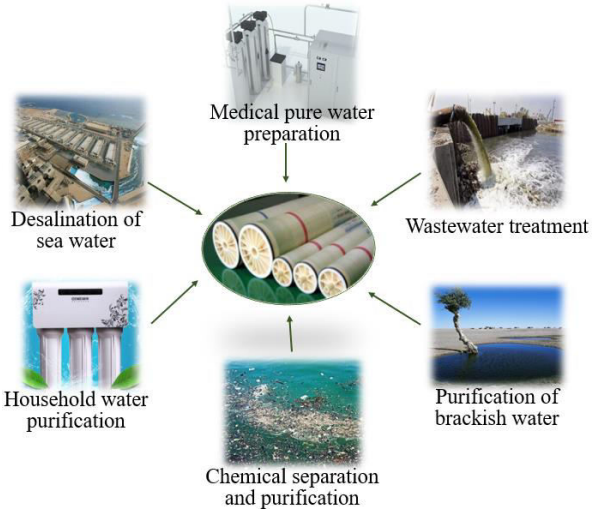
反渗透—21世纪的水净化技术
Reverse Osmosis - Water Purification Technology in the 21st Century

- 以压力差为推动力，将溶剂和溶质进行分离、净化和浓缩
- 模拟生物半透膜的具有一定特性的人工半透膜
- 技术能耗低 安装与维护简便 环境友好



反渗透膜主要组成

➢ 应用Application



➢ 发展史History

20世纪50年代：第一代均质醋酸纤维素反渗透膜

1960年：第二代醋酸纤维素不对称反渗透膜

1978年：第三代复合型聚酰胺反渗透膜

90年代至今：超低压、高脱盐、耐污染、高脱硼高性能聚酰胺复合膜

反渗透技术日益成熟完备

纳滤、反渗透膜材料
NF,RO Membrane Material

膜材料生产及饮用水标准
Membrane material production and drinking water standards

高性能反渗透膜
High performance RO

HX 恒信检测

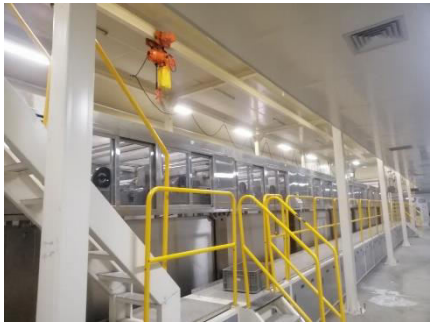
检 测 报 告

报 告 编 号 HX20190722302H 第 2 页/总 2 页

检测结果

序号 No.	检测项目 Test Item	单位 Unit	检测结果 Test Result	判定 Decide	备注 Remarks
未经次氯酸钠处理前					
1	净水流量测试	ml/min	1147	合格	Q320192DMJS005-2019
2	脱盐率测试	%	98.5	合格	Q320192DMJS005-2019
经次氯酸钠处理后（用 500mg/L 浓度的次氯酸钠溶液作为供水，调压阀至开启状态，开启供水阀，压力 100psi，调节浓水阀回收率至 15%，运行 20 小时后做净水流量和脱盐率测试，结果如下）					
3	净水流量测试	ml/min	1136	合格	Q320192DMJS005-2019
4	脱盐率测试	%	97.8	合格	Q320192DMJS005-2019

*****报告结束*****



复合膜放大研发设备实景图

经第三方检测结果表明，经10000 ppm·h 氧化处理，膜性能包括脱盐率和水通量保持稳定，较传统的反渗透膜产品性能更加优异，能够全面替代进口产品，可迅速进入国内外反渗透膜用品市场。

基于干旱条件下应急饮用水水质标准
Emergency drinking water quality standards based on drought conditions

干旱情况下应急饮用水水质指标及限值

（专家咨询会建议修订稿）

指 标	限 值	
	30d以内	90d以内
1、感官性状		
色度（铂钴色度单位）	25	20
浑浊度（NTU-散射浊度单位）	10	5
臭和味	无异臭、异味	无异臭、异味
肉眼可见物	无	无
2、微生物指标[a]		
总大肠菌群（MPN/100mL或CFU/100mL）	不得检出	不得检出
大肠埃希氏菌（MPN/100mL或CFU/100mL）	不得检出	不得检出

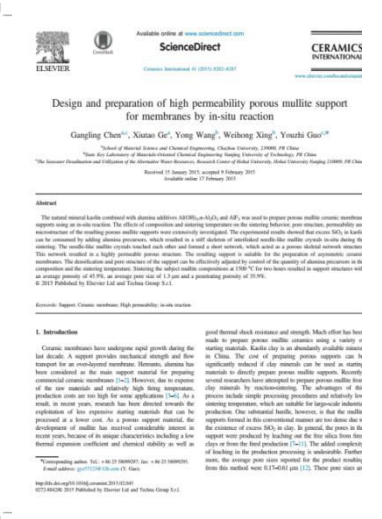
基于干旱条件下应急饮用水水质标准已建立备案

标志性成果与典型案例Iconic achievements and typical cases

论文：成立以来，发表高水平学术论文50余篇，涉及水环境污染物吸附、降解、膜分离材料、技术及等装备等方面。Paper: Since its establishment, more than 50 high-level academic papers have been published, covering the adsorption and degradation of water environmental pollutants, membrane separation materials, technology, and other


Desalination and Water Treatment

Co-sintered synthesis of needle-like mullite porous membrane materials


Ceramics International

Design and preparation of high performance porous mullite support for membranes by in-situ reaction


Water Science & Technology

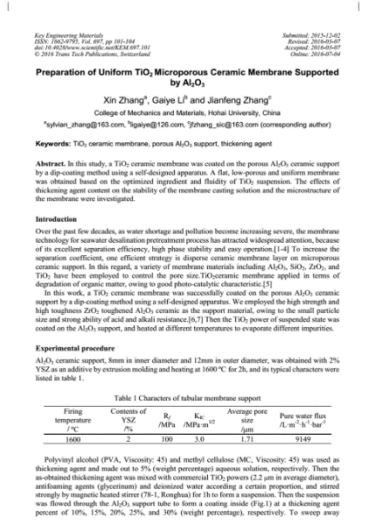
Implementation of dynamic working condition seawater desalination system optimization and simulation model


Water Science & Technology

Optimization design of submerged propeller in oxidation ditch by computational fluid dynamics and comparison with experiments


Shidhanā Vol. 40, Part 8, December 2015, pp. 2313–2331 © Indian Academy of Sciences

System design and optimization study of axial flow turbine applied in an overtopping wave energy convertor


Key Engineering Materials

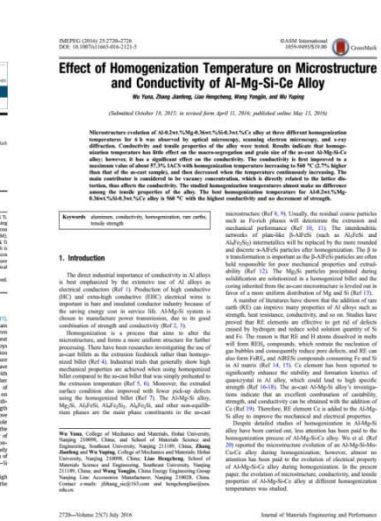
Preparation of Uniform TiO_2 Microporous Ceramic Membrane Supported by Al_2O_3


Applied Surface Science

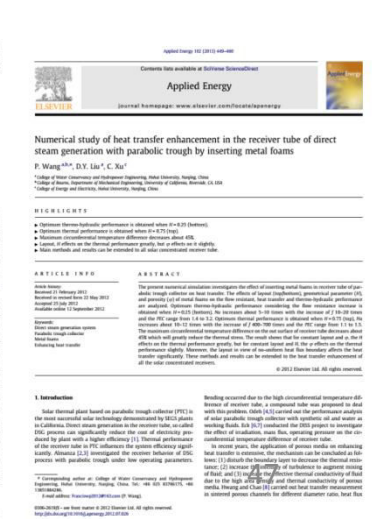
Surface modified MXene Ti_3C_2 multilayers by aryl diazonium salts leading to large-scale delamination


Journal of Alloys and Compounds

Development of high performance near eutectic Al–Si–Mg alloy profile by micro alloying with Ti


JMEPEG (2016) 25:2726–2736

Effect of Homogenization Temperature on Microstructure and Conductivity of Al-Mg-Si-Ce Alloy


Applied Energy

Numerical study of heat transfer enhancement in the receiver tube of direct steam generation with parabolic trough by inserting metal foams

标志性成果与典型案例Iconic achievements and typical cases

专利：申请发明专利40余项，已经授权专利有22项（外国专利12项）Patents: More than 40 invention patents have been applied for, and 22 have been authorized (12 foreign patents)

编号	专利名称	公开号	状态	类别
1	一种高致密度六方氮化硼陶瓷材料的制备方法	201410393724.70	授权	发明专利
2	一种莫来石陶瓷粉体的制备方法	201410253544.90	授权	发明专利
3	一种二维片状二氧化钛纳米片材料的制备方法	201410326990.80	授权	发明专利
4	一种磁致伸缩空蚀仪	201520798202.50	授权	实用新型专利
5	一种类石墨烯二维层状碳化钛纳米片的制备方法	201410243022.00	授权	发明专利
6	一种二氧化硅纳米层包覆的γ-氧化铝粉体材料的制备方法	201410269874.70	授权	发明专利
7	一种磺化二维碳化钛纳米片的制备方法	201510389057.X	授权	发明专利
8	Method for coating metal nanoparticles on oxide ceramic powder surface	11201700921P	授权	发明专利
9	Tungsten carbide-cubic boron nitride composite material and preparation method thereof	11201610563P	授权	发明专利
10	Method for preparing titanium nitride-titanium diboride-cubic boron nitride composite material	GB2535106	授权	发明专利
11	Method for preparing high-density hexagonal boron nitride ceramic material	GB2534530	授权	发明专利
12	一种碳化钨-立方氮化硼复合材料及其制备方法	201410271242.40	授权	发明专利
13	一种氮化钛-二硼化钛-立方氮化硼复合材料的制备方法	201410253601.30	授权	发明专利
14	一种在氧化物陶瓷粉体表面包覆金属纳米粒子的方法	201410392587.50	授权	发明专利

标志性成果与典型案例Iconic achievements and typical cases

标准规范编制 起草国标计划9项，制定国标25项，行业标准20项，地方标准26项。

9 national standard plans have been drafted for the preparation of standard specifications, 25 national standards have been formulated, 20 industry standards have been formulated, and 26 local standards have been established.

起草的国家标准计划

#	计划号	项目名称	制修订	计划下达日期	项目状态
1	20220293-T-332	长江流域及以南区域河湖生态流量确定和保障技术规范	制订	2022/4/28	正在征求意见
2	20213418-T-469	工业浓盐水处理技术规范	制订	2021/8/24	正在起草
3	20203696-T-332	取水计量技术导则	修订	2020/11/19	正在审查
4	20202738-T-469	分离膜孔径测试方法 气体渗透法	制订	2020/8/7	正在批准
5	20201716-T-469	中空纤维帘式膜组件	修订	2020/4/1	正在批准
6	20193126-T-624	水力发电技术基本术语	制订	2019/10/24	正在征求意见

起草的现有标准

#	标准号	标准中文名称	标准类别	发布日期	实施日期	标准状态
1	GB/T 25279-2022	中空纤维帘式膜组件	国家标准	2022/3/9	2022/10/1	即将实施
2	SL 588-2013	水利信息化项目验收规范	行标（水利）	2013/1/22	2013/4/22	现行
3	SL/Z 589-2013	水利信息化业务流程设计方法通用指南	行标（水利）	2013/1/22	2013/4/22	现行
4	SL 604-2012	水利数据中心管理规程	行标（水利）	2012/8/13	2012/11/13	现行
5	SL 462-2012	农田水利规划导则	行标（水利）	2012/3/22	2012/6/22	现行
6	SL 431-2008	城市水系规划导则	行标（水利）	2008/11/10	2009/2/10	现行
7	SL/Z 376-2007	水利信息化常用术语	行标（水利）	2007/5/11	2007/8/11	现行
8	DB32/T 4288-2022	城市防洪规划编制规程	地标（江苏）	2022/6/10	2022/7/10	现行
9	DB32/T 4151-2021	生态清洁小流域建设技术规范	地标（江苏）	2021/12/9	2022/1/9	现行
10	DB32/T 3674-2019	生态河湖状况评价规范	地标（江苏）	2019/12/4	2019/12/25	现行
11	DB32/T 2946-2016	节水型学校评价规范	地标（江苏）	2016/5/20	2016/6/20	现行
12	DB32/T 2950-2016	水稻节水灌溉技术规范	地标（江苏）	2016/5/20	2016/6/20	现行

工业和信息化部司局简函

工科函〔2022〕126号

工业和信息化部科技司关于同意成立工业非常规水利用、石化化工节水、机械工业节能技术装备、退役电池回收利用等四个行业标准化工作组的函

节能与综合利用司：

你司申请成立工业非常规水利用、石化化工节水、机械工业节能技术装备、退役电池回收利用等行业标准化工作组的相关材料已收悉。经审查和公示，并报请部领导同意，现复函如下：

一、同意成立工业非常规水利用行业标准化工作组，主任委员由王孝洋担任，秘书处设在河海大学（委员名单见附件1）；同意成立石化化工节水行业标准化工作组，主任委员由王孝洋担任，秘书处设在中国石油和化学工业联合会（委员名单见附件2）；同意成立机械工业节能技术装备行业标准化工作组，主任委员由王孝洋担任，秘书处设在机械工业节能与资源利用中心（机械工业技术发展基金会）（委员名单见附件3）；同意成立退役电池回收利用行业标准化工作组，主任委员由尤勇担任，秘书处设在中国工业节能与清洁生产协会（委员名单见附件4）。请你司做好对上述四个行业标准化工作组的业务指导和监督管理。

二、请以上行业标准化工作组按照组织章程，汇聚各方力量，扎实做好相关行业标准的组织制定和宣传实施工作，服务产业绿色低碳发展。

此复。

附件：1.工业非常规水利用行业标准化工作组委员名单
2.石化化工节水行业标准化工作组委员名单
3.机械工业节能技术装备行业标准化工作组委员名单
4.退役电池回收利用行业标准化工作组委员名单

工业和信息化部科技司
2022年2月22日

抄送：河海大学、中国石油和化学工业联合会、机械工业节能与资源利用中心、中国工业节能与清洁生产协会。

- 举办国际学术会议 Organizing international academic conferences

IWA国际水协会非常规水资源国际会议
IWA International Conference on Unconventional Water Resources

青岛国际水大会

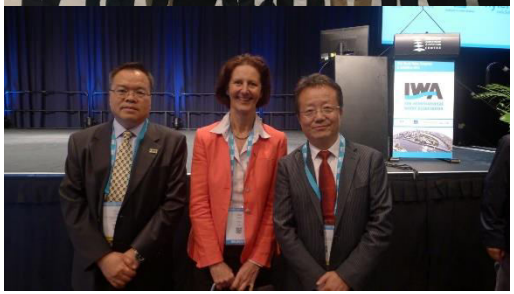
Qingdao International Water Conference

2013 - 2020

6月 青岛 June Qingdao, China

学术交流与培训 Academic Exchange & Training

- 参加国内外学术交流 Participation in academic exchanges at home and abroad



第十届IWA世界水大会暨展览会

X World Water Congress& Exhibition

2016年10月9-15日 Oct. 9-15, 2016

澳大利亚布里斯班 Brisbane, Australia

参观珀斯二期海水淡化工程

Visit to Perth Phase II Desalination Project

中法工业能效工作组第四次会议

4th meeting of the Sino-French Working Group on Industrial Energy Efficiency

中欧工业能效与减排工作组第六次会议

6th Meeting of the China-EU Working Group on Industrial Energy Efficiency and Emission Reduction

2016年10月26-28日 Oct. 26-28, 2016

德国慕尼黑 Munich, Germany

参观施耐德电气 Visit Schneider-Electric

全球脱盐与能源合作大会

Global Desalination and Energy Cooperation Conference

2017年5月10-15日 May 10-15, 2017

以色列特拉维夫 Tel Aviv, Israel

报告：“中国海水淡化发展趋势”

Development trend of seawater desalination in China

与巴勒斯坦伯利恒大学专家交流,参观世界最大膜法海水淡化工厂

Exchange with experts from Bethlehem University, Palestine, Visit the world's largest membrane desalination plant

- 发起相关社团组织 Initiation of relevant associations

社会团体法人

登记证书

（副本）

统一社会信用代码:51320000509183719F

名　　称：江苏省净水设备制造行业协会

业务范围：信息交流、咨询服务、培训协调、编著刊物、承办政府委托事项等

住　　所：南京市鼓楼区清江南路70号14层1401

法定代表人：郭有智

活动地域：江苏省

注册资金：拾万元

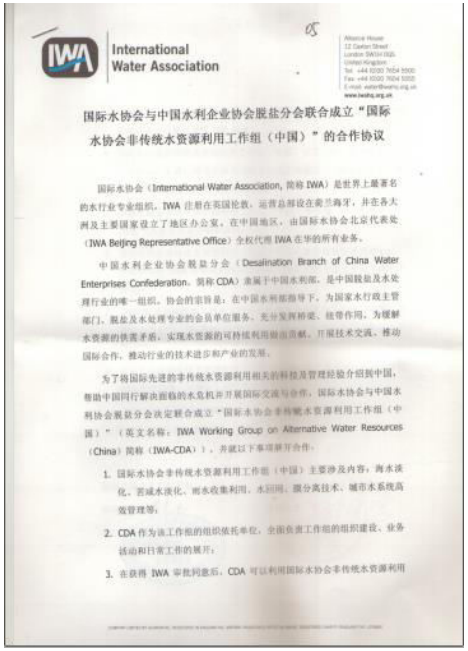
业务主管单位：直接登记

发证机关：

发证日期：2016 年10 月13 日

（有效期限:自2016 年10 月13 日至2020 年04 月29 日）

中华人民共和国民政部监制



International Water Association

国际水协会与中国水利企业协会脱盐分会联合成立“国际水协会非传统水资源利用工作组（中国）”的合作协议

International Water Association

江苏省净水设备制造行业协会
Jiangsu Water Purification Equipment Manufacturing Industry Association

国际水协会非传统水资源利用工作组（中国）
International Water Association Working Group on Non-conventional Water Resources Utilization (China)

- 举办技术培训 **Organize technical training**

海水淡化工程与技术培训班
Training Course on Desalination Engineering and Technology
2016年5月24-27日 May 24-27, 2016
2017年5月14-18日 May 14-18, 2017
授课专家 Lecturer:
天津大学海水淡化研究所 Institute of Desalination, Tianjin University
海河水利委员会 Haihe Water Conservancy Commission
河北工业大学 Hebei University of Technology
山东盐业集团 Shandong Salt Industry Group
西班牙安迅能公司 Axiomtek Spain
韩国LG化学等 LG Chem, Korea, etc.

国家净水行业岗位能力培训
National water purification industry job competency training
颁发国家净水岗位资格证书
Issuance of National Water Purification Job Qualification Certificate

制定《优质饮水水质标准》
Development of Quality Water Standards for Quality Drinking Water

会议会展 Conferences & Exhibitions

青岛国际水大会

Qingdao International Water Conference

广东水展

Guangdong Water Expo

延安论坛

Yan'an Forum

金砖论坛

BRICS Forum

中欧膜产业技术创新合作大会

China-Europe Membrane Industry Technology Innovation Cooperation Conference

2022年 甘肃省陇南市宕昌县、云南省西双版纳勐海县学校捐赠净水装置

Donation of water purification devices to schools in Tangchang County, Longnan City, Gansu Province, and Menghai County, Xishuangbanna, Yunnan Province, 2022

勐海县教育体育局

〔2021〕—337

公益捐赠证明

由中国水利企业协会联盟分会发起向云南省西双版纳傣族自治州勐海县中小学及幼儿园捐赠净水设备的活动于2021年10月份已全面完成。水资源高效利用与工程安全国家工程研究中心给予了技术支持，共计向勐海县西定乡幼儿园、布朗山乡九年制学校、布朗山乡幼儿园、打洛镇中学、打洛镇小学、打洛镇幼儿园、勐满镇小学、勐满镇幼儿园等8所中小学及幼儿园捐赠去除氟、硝酸盐及大肠杆菌等有害物质的净水设备14台（套），有效地保障了教职工和孩子们的饮水安全。感谢协会对公益捐赠活动所做的工作，感谢行业内人士的爱心捐赠。

特此证明！

勐海县教育体育局

2021年10月28日

宕昌县教育局

公益捐赠证明

由中国工业节能与清洁生产协会节水与水处理分会发起向甘肃省陇南市宕昌县中小学及幼儿园捐赠净水设备的活动于2021年10月份已全面安装完成。水资源高效利用与工程安全国家工程研究中心给予了技术支持，共计向宕昌县东辰幼儿园，贾河小学，金木九年制学校，树市小学，旧城中学，理川小学等7所中小学及幼儿园捐赠饮用水净水设备14台（套），有效地保障了教职工和孩子们的饮水安全，感谢协会对公益捐赠活动所做的工作，感谢行业内人士的爱心捐赠。

特此证明！

宕昌县教育局

2021年10月12日

团标《非常规水资源配置与利用规划编制导则》
Group standard "Guidelines for the preparation of unconventional water resource allocation and utilization planning"

- **团标组织单位：**中国水利经济研究会
- Organizational unit of the group bid: China Water Conservancy Economic Research Association
- **编制单位：**河海大学、中国水利水电科学研究院、珠江水利委员会珠江水利科学研究院
- Prepared by: Hohai University, China Water Resources and Hydropower Research Institute, the Pearl River Water Resources Commission
- **目前进展：**编写中
- Current progress: Under preparation

中国水利经济研究会

关于《非常规水资源配置与利用规划编制导则》团体标准的立项公告

按照《中国水利经济研究会团体标准管理办法（试行）》（水经[2020]7号）有关规定，中国水利经济研究会组织开展了《非常规水资源配置与利用规划编制导则》团体标准项目立项工作，经自愿申报、学会初审、专家委员会立项论证、论证结论公示等环节，并由理事长办公会审批，现予以立项，有关信息公告如下：

序号	标准名称	编制单位
1	非常规水资源配置与利用规划编制导则	河海大学、中国水利水电科学研究院

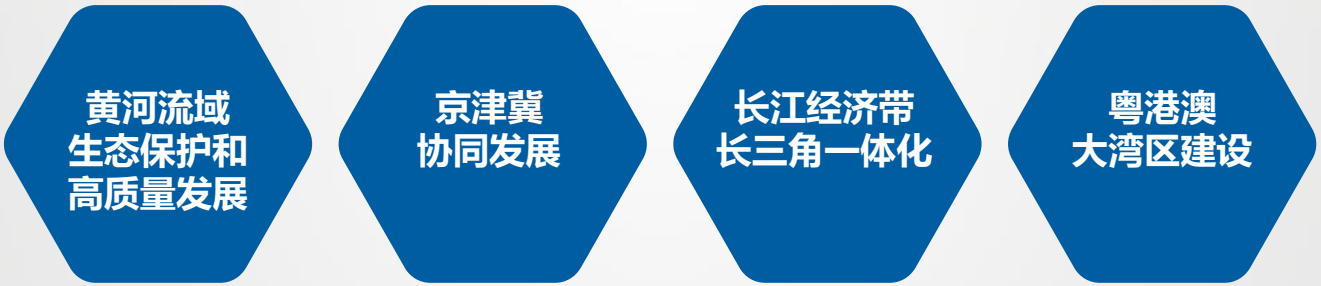
中国水利经济研究会

2023年2月3日

背景意义 Background

水安全危机：水是生命之源，生产之要，生态之基，水安全直接关系国家安全和利益，是保障经济和社会安全高效运行的基本要素。习近平总书记指出：水安全是涉及国家长治久安的大事，全党要大力增强水忧患意识、水危机意识，从全面建成小康社会、实现中华民族永续发展的战略高度，重视解决好水安全问题。为保障水安全、缓解水危机，党中央、国务院高度重视水资源集约节约利用，习总书记提出了“**节水优先、空间均衡、系统治理、两手发力**”的治水思路。

Water security crisis: Water is the source of life, the necessity of production, and the foundation of ecology. Water security is directly related to national security and interests, and is a fundamental element to ensure the safe and efficient operation of the economy and society. To ensure water safety and alleviate water crisis, the Party Central Committee and the State Council attach great importance to the intensive and economical use of water resources。



以上重大国家战略的实施，都要求通过**“把水资源作为最大的刚性约束”**来实现社会经济的高质量发展。

The implementation of the above major national strategies requires achieving high-quality social and economic development through "using water resources as the maximum rigid constraint".

背景意义 Background

非常规水源

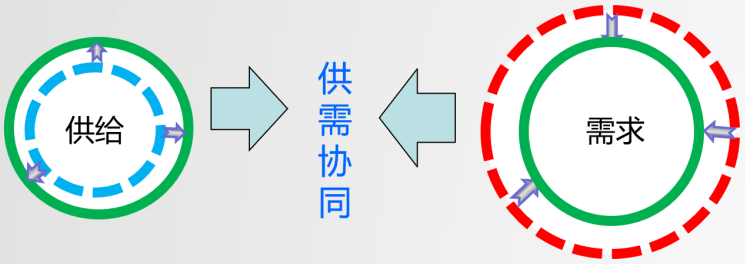
Unconventional Water Resources

非常规水源是常规水资源开发利用的重要补充，是新时期推进节约用水工作、贯彻落实“十六字治水思路”的重要举措，发展好非常规水源利用是我国缺水形势下的现实需求和国家导向。

Unconventional water sources are an important supplement to the development and utilization of conventional water resources, and an important measure to promote water conservation in the new era and implement the "Sixteen Character Water Control Strategy". Developing the utilization of unconventional water sources is a practical demand and national direction in China's water shortage situation.

背景意义 Background

解决水资源短缺问题的两大路径
Two major paths to solve the problem of water resource shortage



大力推动非常规水利用，缓解水资源的供需矛盾，已是国家战略需求。“十四五”时期，非常规水作用将日渐凸显

Vigorously promoting unconventional water utilization and alleviating the supply-demand contradiction of water resources has become a national strategic demand. During the 14th Five Year Plan period, the role of unconventional water will become increasingly prominent

政策	发布单位	发布时间
《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》	中央人民政府	2021
《“十四五”节水型社会建设规划》	发改委、水利部、工信部等五部门	2021
《关于印发“十四五”用水总量和强度双控目标的通知》	水利部、发改委	2022
《“十四五”水安全保障规划》	发改委、水利部	2022
《关于推进污水资源化利用的指导意见》	发改委、科技部等十部门	2021
《“十四五”城镇污水处理及资源化利用发展规划》	发改委、住建部	2021
《海水淡化利用发展行动计划（2021-2025年）》	发改委、自然资源部	2021
《黄河流域水资源节约集约利用实施方案》	发改委、水利部等五部门	2021
《国家节水行动方案》	发改委、水利部	2019
《关于非常规水源纳入水资源统一配置的指导意见》	水利部	2017

- 实施深度节水控水行动，建立水资源刚性约束制度，鼓励再生水利用。
- 建立水资源刚性约束制度，将非常规水源纳入水资源统一配置，逐年扩大利用规模和比例，**到2025年，全国非常规水源利用量超过170亿立方米**。
- 2022年《通知》**首次将非常规水源最低利用量作为控制目标分解下达到各省、自治区、直辖市**。
- 到2025年，全国地级及以上**缺水城市再生水利用率达到 25%以上**，京津冀地区达到 35%以上，黄河流域中下游地级及以上缺水城市力争达到 30%。
- 到 2025 年，全国**海水淡化总规模达到 290万吨/日以上，新增规模 125 万吨/日以上。**

2025年各省、自治区、直辖市用水总量和强度双控目标：非常规水源利用量

Target for total and intensity of water use in various provinces, autonomous regions, and municipalities in 2025: utilization of unconventional water sources

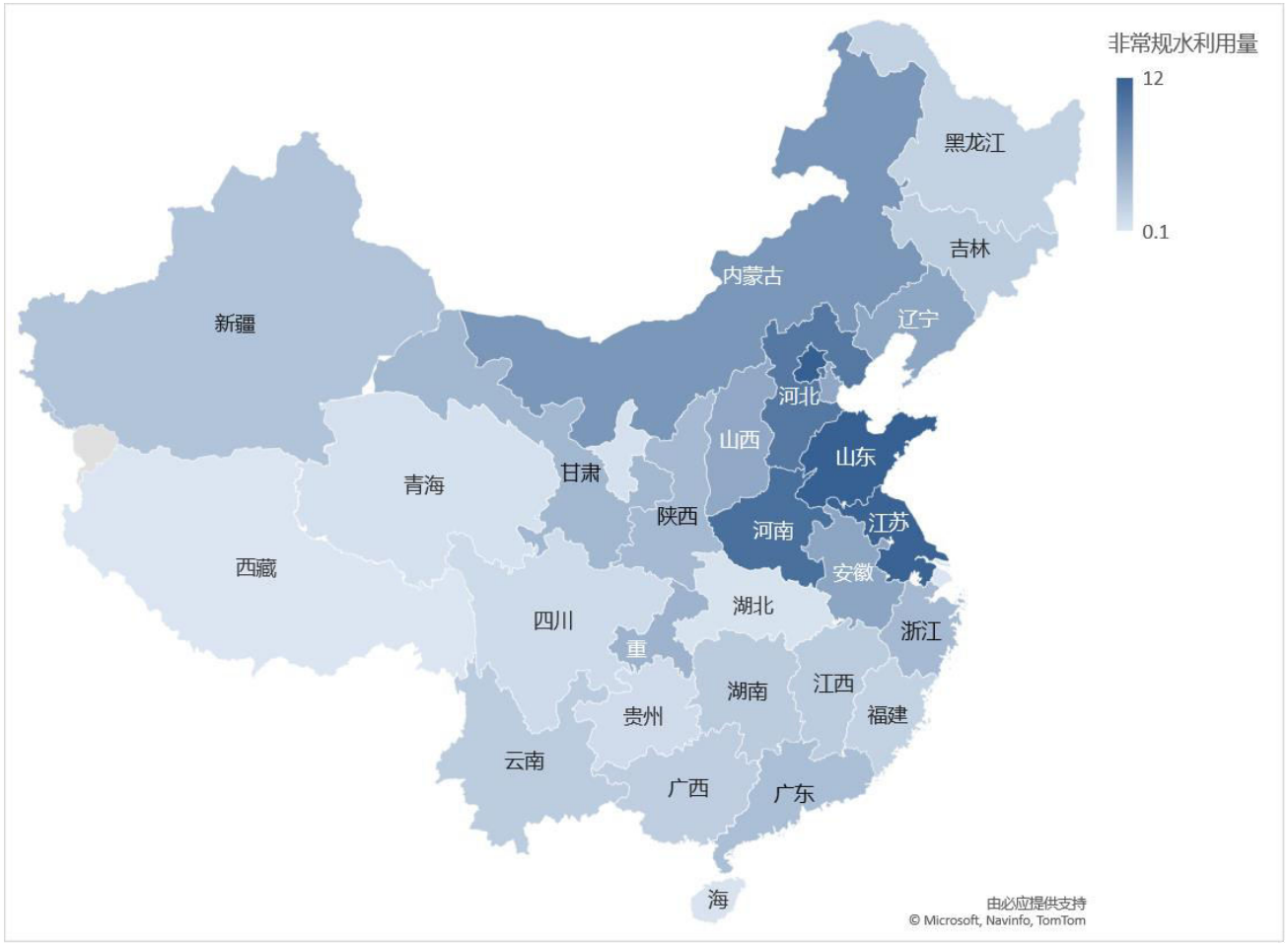
行政区	用水总量（亿立方米）	其中：非常规水源利用量（亿立方米）	万元国内生产总值用水量比 2020 年下降（%）	万元工业增加值用水量比 2020 年下降（%）	农田灌溉水有效利用系数
北京	42.5	12.0	10.0	10.0	0.753
天津	35.0	6.4	10.0	10.0	0.725
河北	206.0	14.2	15.0	13.0	0.678
山西	85.0	6.0	12.0	10.0	0.580
内蒙古	196.3	7.4	12.0	13.0	0.579
辽宁	140.0	6.3	14.0	12.0	0.593
吉林	137.3	3.4	16.0	13.0	0.610
黑龙江	363.3	2.0	12.0	13.0	0.613
上海	112.0	0.2	16.0	16.0	0.740
江苏	620.0	15.2	17.0	19.0	0.625
浙江	186.8	5.2	16.0	18.0	0.615
安徽	306.0	7.0	18.0	18.0	0.580
福建	189.9	2.2	20.0	18.0	0.574
江西	262.3	3.7	20.0	18.0	0.527
山东	241.1	15.0	16.0	10.0	0.651
河南	260.7	12.4	16.0	10.0	0.629
湖北	318.0	4.0	16.0	16.0	0.545
湖南	334.5	3.0	17.0	12.0	0.570
广东	435.0	5.0	16.0	10.0	0.535
广西	301.0	3.6	16.0	16.0	0.524
海南	53.0	0.4	18.0	12.0	0.580
重庆	79.9	5.0	15.0	15.0	0.515
四川	270.0	6.1	16.0	16.0	0.505
贵州	117.0	1.2	16.0	20.0	0.503
云南	177.0	4.1	20.0	16.0	0.520
西藏	37.1	0.2	19.0	16.0	0.463
陕西	107.0	5.0	12.0	10.0	0.585
甘肃	120.9	5.2	13.0	10.0	0.590
青海	29.6	1.2	10.0	10.0	0.510
宁夏	72.8	2.0	15.0	10.0	0.590
新疆	563.0	5.4	20.0	12.0	0.585
全国	6400	170	16.0	16.0	0.580

2000-2020年非常规水源利用与全国供水总量对比
Comparison of unconventional water source utilization and total national water supply 2000 - 2020

开发利用非常规水资源的意义
The significance of utilizing unconventional water resources

2022中国各省(自治区、直辖市) 非常规水资源开发利用量分布

Distribution of unconventional water resource utilization in various provinces (autonomous regions, municipalities) of China in 2022



背景意义 Background

缺乏顶层设计，全国、流域、区域层面的系统规划缺失
Lack of top-level design, lack of systematic planning at the national, watershed, and regional levels

欲破坚冰，规划先行

非常规水源利用规划是推进非常规水源开发利用、提升区域水资源配置效率和利用效益、提高水资源管理水平的顶层设计和基础工作，是深化水资源节约集约利用、推动十四五目标实施的重要举措和支撑。

标准缺失，亟需完善

为有效指导非常规水源利用规划编制，确保各级各地非常规水源利用规划的系统性、统一性、科学性、可操作性，使规划工作有章可依，实现非常规水源优水优用、合理布局、高效利用、优化配置和科学管理，亟需开展非常规水源利用规划编制标准研究。

背景意义 Background

现有标准

目前国内还没有针对性的非常规水源利用规划相关指导规范。现已发布实施的、有效的涉及非常规水源利用的标准有《水资源规划规范》（GB/T 51051-2014），《城镇再生水利用规划编制指南》（SL760-2018）。

《水资源规划规范》（GB/T 51051-2014）：

- 已考虑到非常规水源的开发利用。
- 但作为一个系统性规划规范，其涉及面较全，在其中非常规水源开发利用内容不够突出，对指导非常规水源利用规划编制的作用还不足，而且未涉及到矿井水等水源的利用。

存在不足

背景意义 Background

通过非常规水源利用规划编制导则的制定，细化非常规水源利用规划条款，统一非常规水资源利用规划编制的基本原则、主要内容与技术方法，明确规划编制流程和工作要求，以保障非常规水源利用规划工作高质量完成，满足流域和区域非常规水资源规划和管理工作的需要。

By formulating guidelines for the preparation of unconventional water source utilization planning, refining the terms of unconventional water source utilization planning, unifying the basic principles, main contents, and technical methods of unconventional water resource utilization planning, clarifying the planning process and work requirements, to ensure the high-quality completion of unconventional water source utilization planning work and meet the needs of unconventional water resource planning and management work in the basin and region.

适用范围和主要章节
Scope of application and main chapters

- 本文件确立了非常规水源利用规划编制的基本原则、主要内容与技术方法，给出了规划编制流程和工作要求。
- This document establishes the basic principles, main contents, and technical methods for the preparation of unconventional water source utilization planning, and provides the planning process and work requirements.
- 本文件中所指非常规水源包括再生水、淡化海水、集蓄雨水、微咸水和矿井水。
- The unconventional water sources referred to in this document include recycled water, desalinated seawater, rainwater harvesting, brackish water, and mine water.
- 本文件适用于集水面积3000km^{2}及以上流域、地级行政区及以上区域的非常规水源利用规划和非常规水源开发利用及调配管理等专项规划的编制工作。
- This document is applicable to the preparation of special plans for the utilization of unconventional water sources and the development, utilization, and allocation management of unconventional water sources in watersheds with a catchment area of 3000km2 or above, prefecture level administrative regions, and above.

适用范围和主要章节
Scope of application and main chapters

1 范围 range

2 规范性引用文件

Normative References

3 术语和定义

Terms and definitions

4 总体要求

General requirements

5 非常规水源及其开发利用现状评价

Evaluation of unconventional water sources and their development and utilization status

6 规划目标与任务制订

Planning objectives and task formulation

7 需水预测

Water demand prediction8

8 非常规水源供水预测

Prediction of unconventional water supply sources

9 非常规水源供需分析

Analysis of supply and demand of unconventional water sources

10 非常规水源配置

Unconventional water source configuration

11 实施方案制订与效果评价

Implementation Plan Development and Effect Evaluation

12 非常规水源管理及规划保障措施制订

Development of unconventional water source management and planning guarantee measures

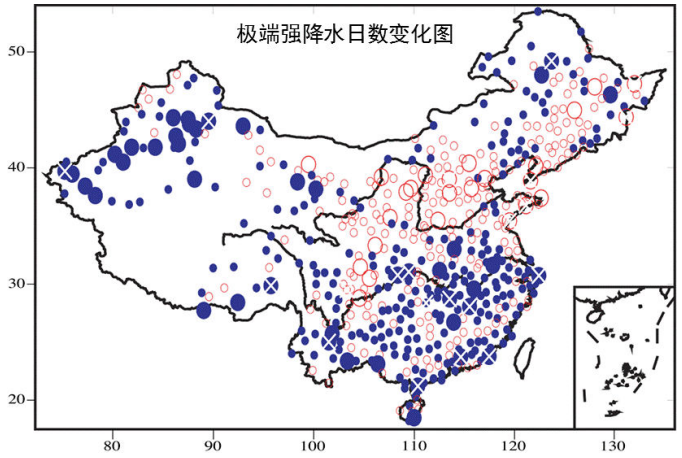
预期效益Expected benefits

社会、生态效益

- 为非常规水源配置、利用技术标准体系建设提供技术支撑
- Provide technical support for the construction of technical standard systems for unconventional water source allocation and utilization
- 推动非常规水源的合理开发、科学管理
- Promote the rational development and scientific management of unconventional water sources
- 缓解水资源危机，保障供水安全，助力经济社会可持续发展
- Relieve water resource crisis, ensure water supply safety, and assist in sustainable economic and social development

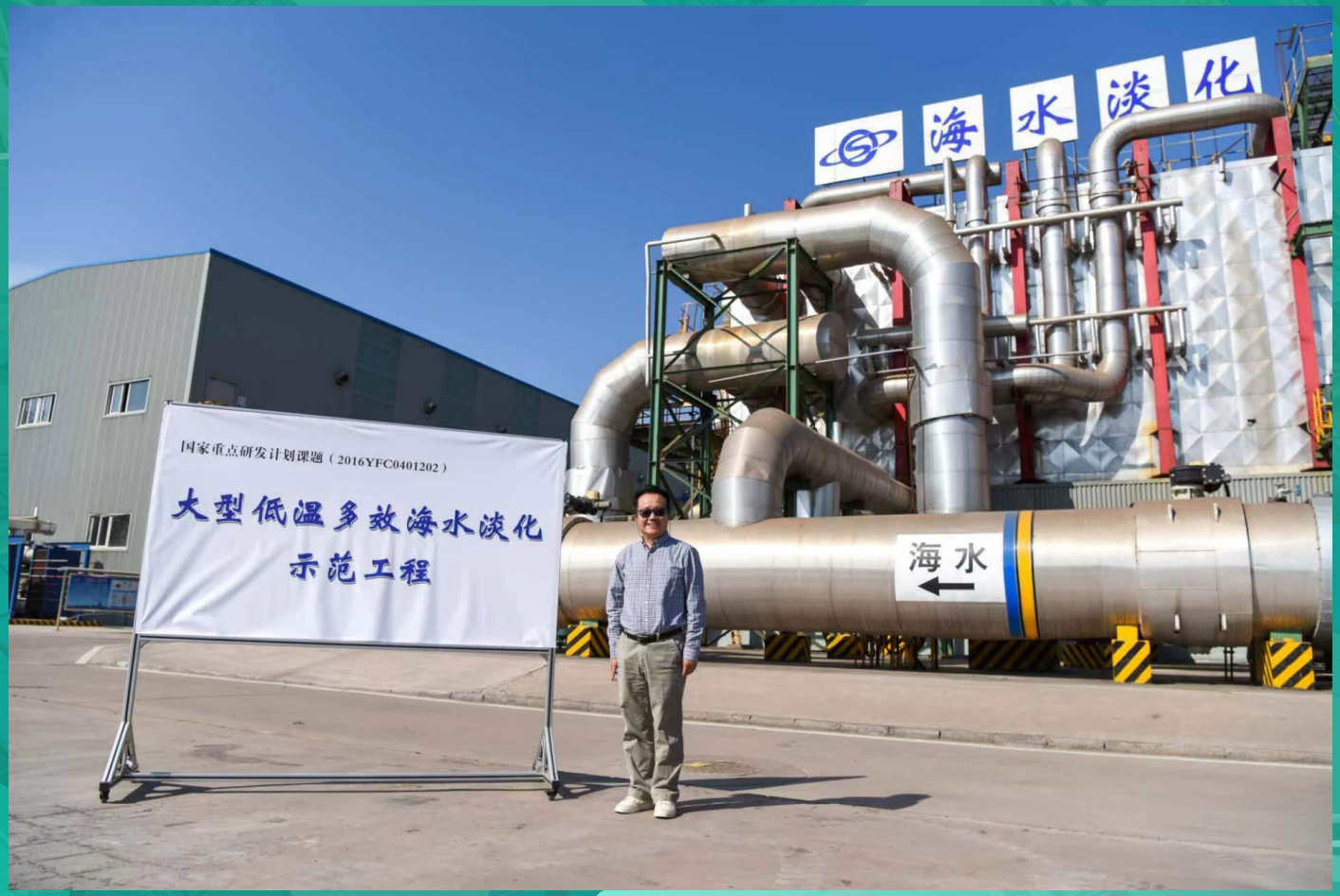
总体目标Overall Objectives

- 到2025年，**全国非常**规水源利用量超过170亿立方米；地级及以**上缺水城市再生水利用率达到25%以上，黄河流域中下游力争达**到30%，**京津冀地区达到35%以上**；**具**备条件的地区集蓄雨水、**海水及海水淡化水、**矿坑**(井)水、微咸水利用**规模进一步扩大；**非常**规水源配置利用能力持续增强，形成先进适用成熟的再生水**配置利用模式**，**全社会**对非常规水源接受程度明显提高。



- 到2035年，**建立起完善的非常**规水源利用政策体系和市场机制，**非常**规水源经济、高效、系统、安全利用的局面基本形成。

- By 2025, the utilization of unconventional water sources in China will exceed 17 billion cubic meters; The utilization rate of renewable water resources in cities with water scarcity at or above the prefecture level should reach over 25%, with efforts to reach 30% in the middle and lower reaches of the Yellow River Basin, and over 35% in the Beijing Tianjin Hebei region; The scale of rainwater collection, seawater and seawater desalination, mine (well) water, and brackish water utilization in areas with conditions will be further expanded; The ability to allocate and utilize unconventional water sources continues to enhance, forming an advanced, applicable, and mature mode of renewable water allocation and utilization. The acceptance of unconventional water sources by the whole society has significantly increased.By 2035, a comprehensive policy system and market mechanism for the utilization of unconventional water sources will be established, and a situation of economic, efficient, systematic, and safe utilization of unconventional water sources will be basically formed.


海水淡化
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