



城市适应气候变化国际研讨会
主办：国家发改委、住建部、亚行



中国的水安全问题与适应气候变化

China's Water Security Issues and Adaptation to Climate Change

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汇报提纲(Outline)

1

中国水安全问题的宏观判断

Macro judgment on China's water security issues

2

水安全、气候安全与适应

Water security, climate security, and Adaptation

3

适应气候变化下的国家水安全战略

Strategy and policy recommendations of national water security under climate change



经济社会发展与资源环境问题的考虑因素(1)

Comprehensive factors for socio-economic development and resource/emissions scenarios (1)

● 国内因素 Domestic

- **经济发展**：人口增长、工业化、城市化、**经济安全**
Economic development: population, industrialization, urbanization, economic security
- **社会进步**：社会共识、立法进程、就业、地区差距、**社会稳定**
Social progress: consensus, legislation process, employment, regional disparity, social stability
- **环境保护**：资源能源供应安全，**雾霾**、水污染、土壤修复，碳减缓、适应
Environmental protection: supply of resource/energy, smog/PM2.5, water pollution, soil restoration, mitigation and adaptation
- **技术创新与竞争力** Innovation and competitiveness
- **实践经验**：“十一五”、“十二五”节能减排与低碳试点
Experience during 11th and 12th FYPs on energy efficiency and low carbon pilot



经济社会发展与资源环境问题考虑因素(2)

Comprehensive factors for socio-economic development and resource/emissions scenarios (2)

- **国际因素 International aspect**

- 减缓和适应义务 mitigation and adaptation obligations

- 增长贡献：经济复苏、国际分工与产业链

- **Growth contributions: economic restoration, intern'l labor division and industrial chains**

- 国际减排和低碳转型经验

- International experience and lessons on low-carbon development and transformation

- 全球合作 Global cooperation

- **考虑的因素不断增加，需要探讨“社会经济-能源-环境-碳排放-政策”综合情景和均衡模型**

- **Increasing factors considered, equilibrium model and integrated scenario needed**



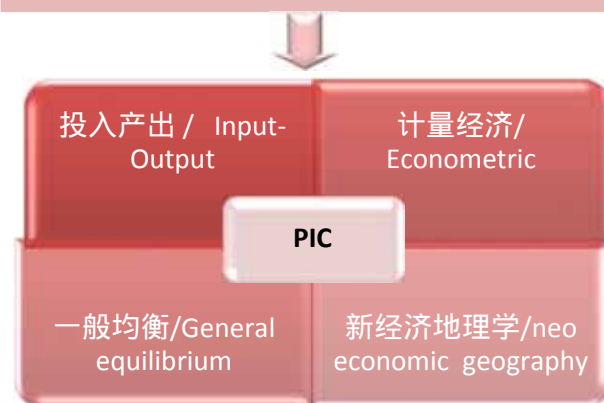
中国政策模拟模型 (PIC) : 区域间政策分析模型

Policy Insight of China (PIC) model: the Inter-regional policy analyzing model

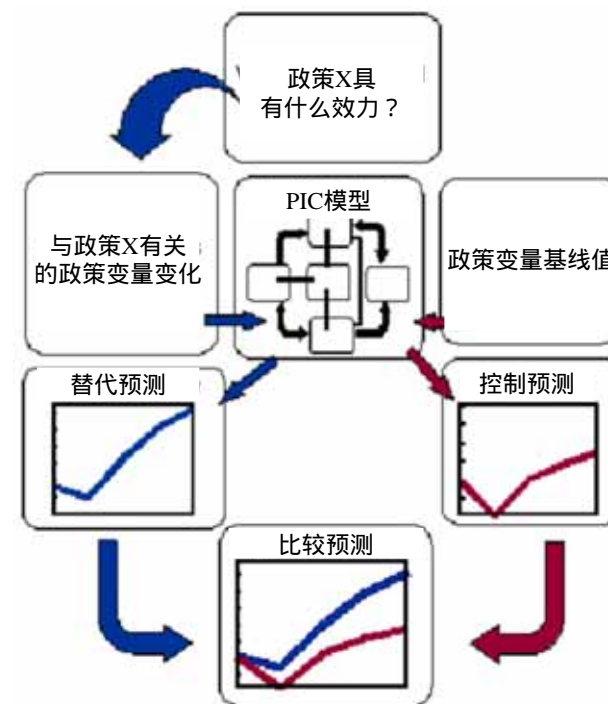
32个省区/32 regions
58个部门/58

- sectors 部门之间的相互关系
- 分析价格信号对生产者和消费者的影响及相应反馈
- 融入区域间的经济地理联接，分析区域间竞争力
- 随时间变化的趋势

- 基准情景/ Baseline
- 部门划分及定义 / Sectors
- 单个政策的成本效益分析 / cost-benefit analysis for policy



- 人口、就业、经济增长、可持续性能源、排放、.....
- Population, employment, economic growth, Energy & emissions, sustainability...

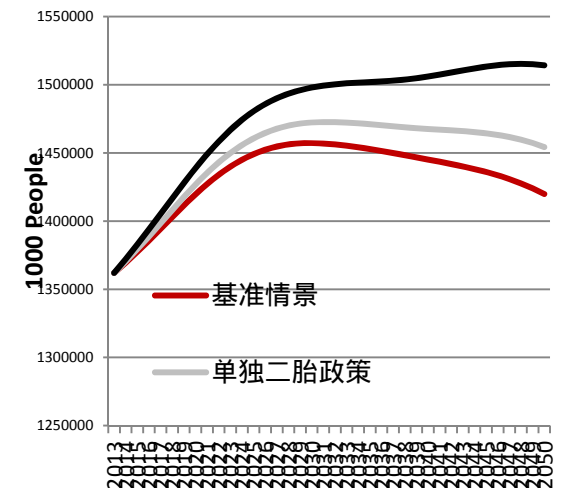
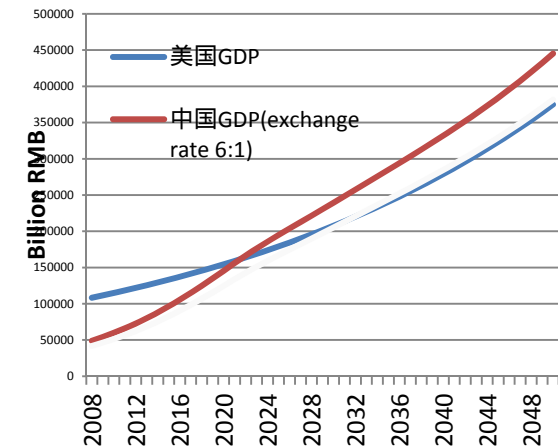


基准情景：快速增长及转型

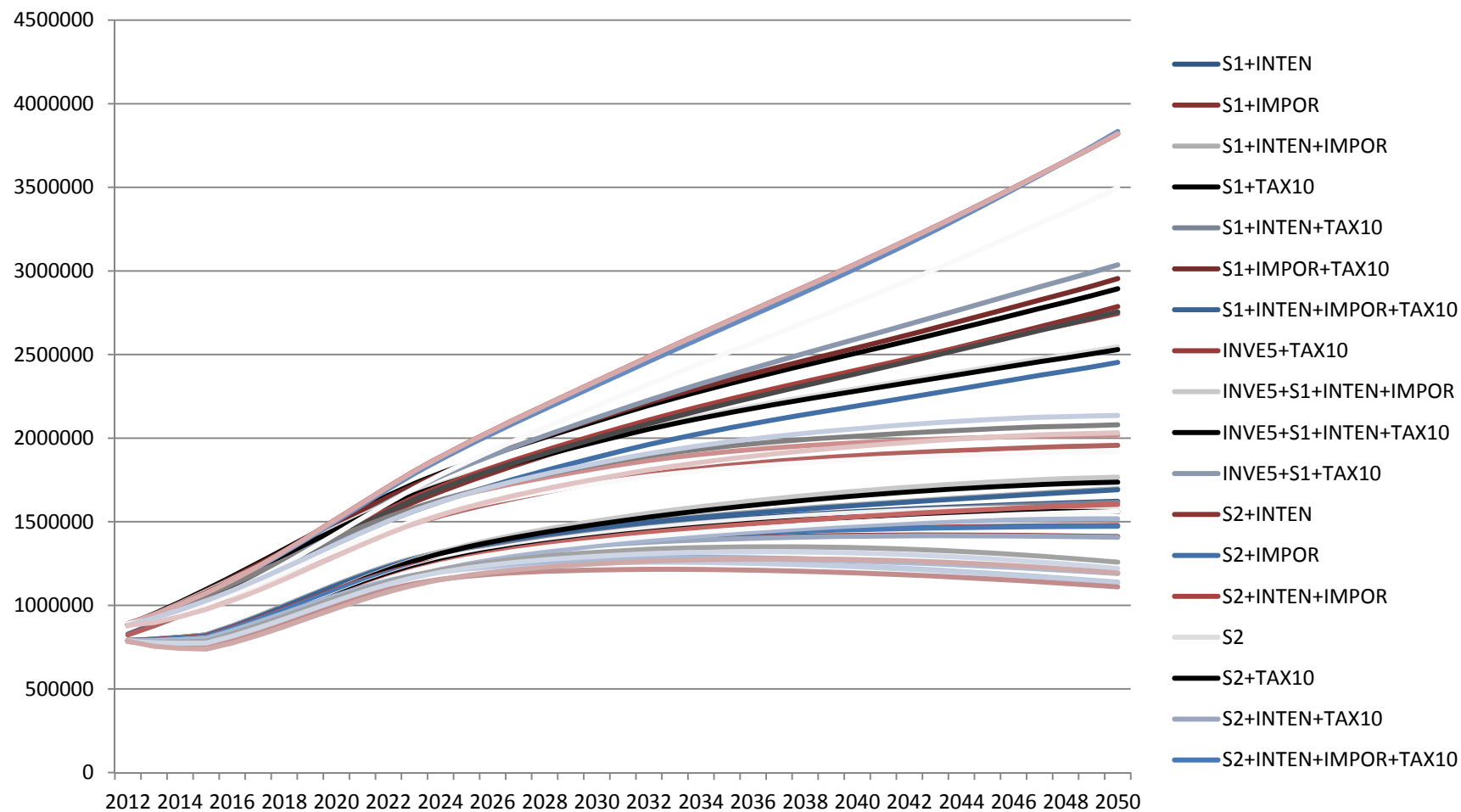
Baseline : China's fast development

- 未来中国经济增长将会逐步放缓；
- 能源排放增长总体上依赖于经济增长，能源增速也将放缓。
- 在基准情景中，我们没有考虑太多的能效提高和改进。
- China's economic growth will gradually slow down in the future;
- Energy emissions growth is dependent on the overall economic growth ;
- In the baseline, we do not think too much about the energy efficiency and its improvement

	2015	2020	2025	2030	2035	2040	2045	2050
population	1.377	1.410	1.449	1.457	1.453	1.445	1.436	1.420
Economic growth rate	7.5	7	6	5	4.5	4.0	3.7	3.5
Urbanization	56.4	60.0	63.0	66.0	68.3	70.5	72.8	75.0
Portfolio of Service Industry	44.46	44.50	47.35	50.20	53.20	56.20	58.70	61.20
Energy intensity (Tons of standard coal per USD GDP)	0.10	0.09	0.09	0.08	0.07	0.07	0.06	0.06



不同政策组合情景下的碳排放 Carbon emissions by policy mix



中国资源环境峰值组合的结论

Conclusions for peak package simulation

- 基准情景难以实现碳排放峰值，人口、能耗、排放等峰值相互联系和影响

Peaks of population, energy consumption, and carbon emissions are linked to each other

- **中国的主要峰值时段：能源结构调整至关重要**

- 人口总量：2031-2046年
- 煤炭消费总量：2026-2030年；阶段性控制目标从“十三五”开始峰值，目标年可争取2025年
- PM2.5排放总量：2026-2030年；重点区域可提前
- 碳排放峰值：2031-2035年，峰值目标年可争取2030年

- **Peak timeframe: energy mix restructuring crucial**

- Population: 2031-2046 (plateau period)
- Coal consumption: 2026-2030 ; target year for peak to strive for: 2025
- PM2.5: 2026-2030 ; partial region could reach at peak earlier
- CO₂ emissions: 2031-2035; target year to strive for: 2030

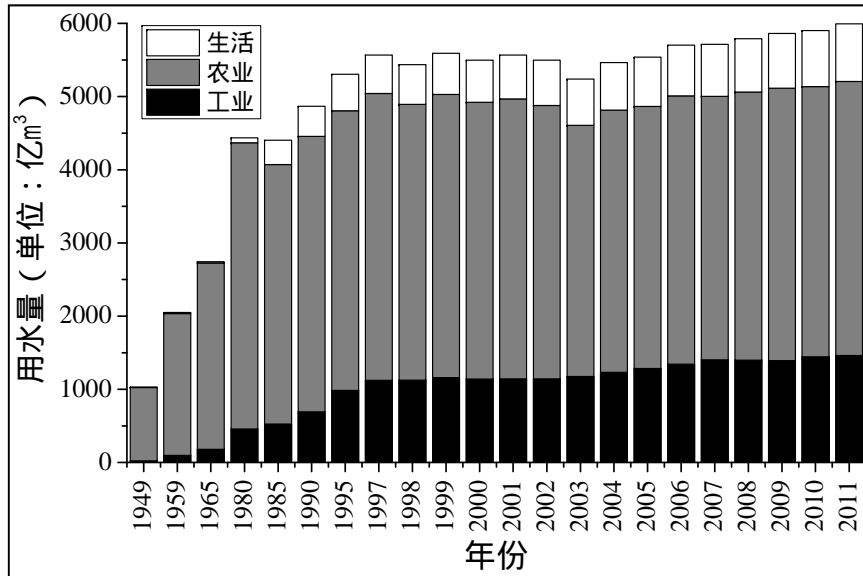


水资源利用的峰值判断

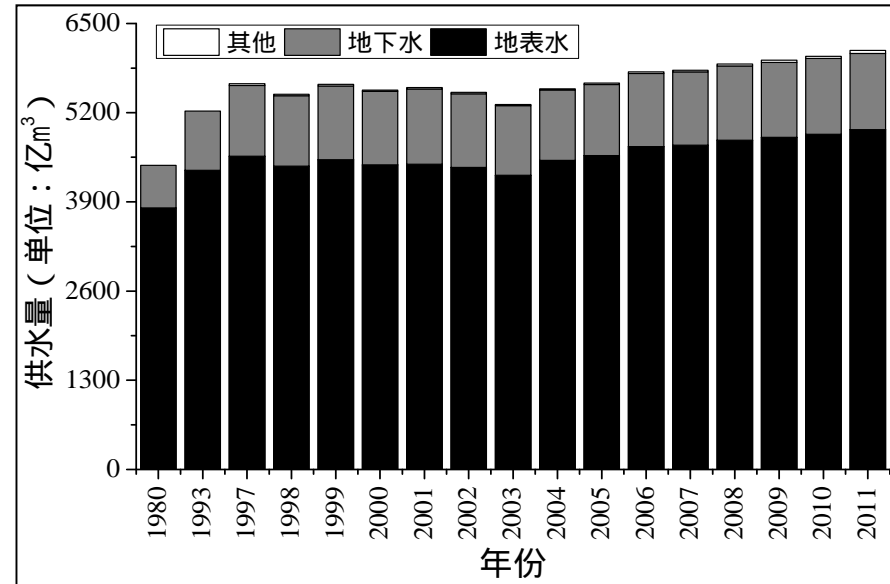
Water Use Peak in China

水资源问题 (Water resource problems)

- 用水总量平稳：农业60%以上；工业增长至25%；生活12.5%左右
Steady water use: agriculture > 60%, industry ↑ to 25%, civilian ≈ 12.5%
- 水资源利用效率较低，一些地区地下水超采严重
Low water use efficiency, over-exploitation of groundwater in some regions
- 水资源峰值：6500-7000亿m³
Water use peak: 650-700 bn m³



中国1949~2011年用水量变化
Water use change of China in 1949-2011



中国1980~2011年供水量变化
Water supply change of China in 1980-2011



中国水安全问题的宏观判断

Macro judgment on China's water security issues

- 水资源开发与保护取得成绩，总体基本平衡
Achieved basic balance in water resources development and protection
- 不存在全局性安全风险，水安全防范重点发生变化
No overall security risks, water security focus has changed
- 局部水问题及水安全挑战仍然突出
Regional water issues and water security



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新的国家安全观

New view of National security

● 总体安全观 Integrated security

- 传统安全：政治安全、国土安全、军事安全等
Traditional security: political, territory, military, etc.
- 非传统安全：经济安全、社会安全、信息安全、生态安全、资源安全、核安全等
Non-traditional security : economic, social, info., ecological, resource, nuclear, etc.
- 资源环境安全是政治安全、经济安全的保障
Resource and environmental security is the foundation of political and economic securities



中国水安全的挑战

Challenges of China's water security

- 饮用水安全的核心地位 Drinking water safety crucial
- 流域性、区域性水安全问题突出 Basin and regional water security serious
 - 流域性水污染 water pollution at river basin level
 - 西北、华北地区水短缺和生态保护 water shortage and conservation in north and northwest regions
 - 国际河流开发与保护 development of international rivers
- 存在因部分水问题引起的局部水危机 Regional water crisis caused by water problems
 - 如水污染公共安全事件 eg., Water pollution accidents
- 水的不同功能开发间的冲突日益显现 Conflicts of different water functions
 - 水资源、水环境、水生态、水灾害、水管理，水与发展
Water resource, environment, ecology, disaster, management and development



气候安全与适应

Climate security and Adaptation

● 气候安全：增长的挑战

Climate security: increasing challenges

- 气候变化下的极端天气气候事件 **extreme climate events**
- 水供应挑战 **water supply**
- 水-能源-气候耦合 **water-food-energy-climate nexus**
- 水坝建设：两难选择 **dam building: dilemma and sustainable hydropower development**
- 不确定性 **uncertainty**
- 新的管理模式 **new management pattern**
 - ✓ 适应扮演重要角色 **a key role of adaptation**
 - ✓ 部门协调与贸易转型 **governance and trading**



应对水安全问题的主要障碍

Main obstacles in countering water security issues

● 缺少水安全综合立法安排

Lack of comprehensive water security legislation arrangements

➤ 国家层面的问题 (National level)

- 立法间缺乏协调和配合 Lack of coordination and cooperation between legislative
- 缺乏跨部门及行政区综合管理规定 Lack of cross-sector comprehensive provisions
- 缺乏程序性立法，执法不严 Lack of procedural legislation, weak enforcement
- 一些协调利益相关方的水资源和水环境管理制度缺失

lack of coordination of stakeholders in environment management systems

➤ 地方层面的问题 (Regional level)

- 各地方立法进展不平衡 Imbalance in local legislative progress
- 立法缺乏地方特色制度安排
- 地方立法大多缺乏可操作性 Weak feasibility in local legislation
- 各相关立法缺乏协调和配合，甚至相互冲突

Lack of coordination and cooperation in legislation, even conflicting



应对水安全问题的主要障碍

Main obstacles in countering water security issues

- 水利、环保部门冲突，治理结构待理顺 **Governance reform needed**
- 流域管理机制不健全 **River basin management mechanism is not complete**
- 经济手段尚未完全发挥其应有的作用 **Economic means is not fully play its role**
- 缺少完善的信息共享机制和公众参与机制
Lack of information-sharing and public participation mechanisms
- 水资源领域科技发展支撑不足
Insufficient support to water-related technology development
- 针对新问题的研究和应对措施不足 **Lack of countermeasures to new problems**
 - 缺乏气候变化、水资源与其他要素之间的互联性、国际涉水冲突等问题对中国水安全影响的研究及有效应对策略
Lack of study on relationship among climate change, water resources and other factors, as well as effective coping strategies for international water conflicts
 - 区域/流域水安全问题缺少系统考虑
Lack of systematic consideration for regional / basin water security issues



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3 适应气候变化战略下国家水安全的战略举措和政策建议

Strategy and policy recommendations of water security under climate change

- I. 适应气候变化战略背景下的水安全战略：强化监管、改善治理、综合风险管理、构建气候安全框架 Water security strategy under climate change: strengthening regulation, improving governance, integrating risk management , and building climate security framework
- 保障饮用水安全应成为新时期水安全的战略重点，构建气候安全框架
Strategic focus : to secure drinking water
 - 关注综合水安全问题：特别是流域综合管理
Concern comprehensive water security problems: in particular, integrated river basin management (IRBM)
 - 提高综合节水能力、保护水源地、解决流域性水污染、适应气候变化成为重点任务
Enhance water saving, tackle basin pollution, adapt to climate change
 - 涉水法律修改，体制改革与制度建设，充分发挥政府与市场作用
Reform Water institutions, exert function of government and market
 - 重点地区、流域的生态文明建设与水安全，特别是中西部落后地区
Integrate economic reform, ecological civilization and water security in key regions and basins, especially in western China
 - 城市水安全适应，应对低端气候事件：责任分工、协调、工程程序
addressing ECEs in city: responsibility, coordination, and procedure



3 适应气候变化战略下国家水安全的战略举措和政策建议

Strategy and policy recommendations of water security under climate change

II. 重构水管理制度框架 Restructure water management institution

➤ 修改涉水相关法律 Revise water related laws

- 根据新修订的《环保法》相应修改《水污染防治法》和《水法》 Revise Water Pollution Prevention Law and Water Law based on new EPL
- 探讨“大江大河法”及流域性立法的可行性
Explore the feasibility of major rivers law and basin legislation

III. 构建基于流域综合管理理念的流域治理体系 Constitute basin governance

➤ 整合流域管理机构的功能 Integrate the function of basin administration

➤ 统筹协调相关涉水法律，促进流域管理的立法进程 Enhance river basin legislation

➤ 综合论证大江大河的流域综合规划及重大水利建设项目，积极推进中小河流规划，开展以流域为单元的河流治理 Implement river basin governance

➤ 加大流域综合管理体制改革的力度，建立和完善涉水部门之间的联络与协调机制，开展跨行政区的流域综合管理试点 Cross-sector comprehensive management trial

3 适应气候变化战略下国家水安全的战略举措和政策建议

Strategy and policy recommendations of water security under climate change

IV. 制定综合性水安全战略规划 Formulate comprehensive water security plan

V. 制定以水价为中心的经济政策框架，推进水资源制度创新

Set up water price centered economic policy frame

➤ 水资源产权制度与交易制度

Water resource property and trading system

➤ 推广实施统一定价法

Promote unified pricing

➤ 完善水污染治理特许经营制度

Improve water treatment licensing system

➤ 实行最严格的水资源管理制度

Implement most rigid water resource management

VI. 建立长效的流域治理投融资机制和生态补偿机制

Establish long term basin investment and ecological compensation mechanism

3 适应气候变化战略下国家水安全的战略举措和政策建议

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VII. 开展涉水绩效评估，促进中国水安全的持续改善 Undertake water management performance evaluation, improve China's water security

- 开发科学的绩效评估方法，拓宽、健全评估信息渠道及系统

Develop scientific appraisal method, improve evaluation information channel and system

- 完善制度评估，制定水安全绩效评估的指导意见

Improve institutional evaluation, propose security performance evaluation instruction

- 建立有效的结果反馈机制 Establish effective feedback mechanism

VIII. 实行水安全分级分类管理，构筑水安全综合风险管理体系 Constitute comprehensive water security risk management system

- 根据4类风险因子进行水安全管理分类，并根据规模进行分级管理

自然条件因子；社会经济因子；工程因子；管理因子

4 categories risk factors: natural condition, socio-economic, engineering, management

- 构建水安全综合风险管理体系，区分突发重大风险和部门风险管理

Distinguish sudden significant risks and departmental risk management

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IX. 提升水资源基础研究能力，发展水资源综合管理关键技术

Improve water resource research competence, develop key management technology

- 科学评估和完善“涉水生态红线”

Scientifically assess and complete “water ecological red line”

- 建立全球尺度水文水资源监测与研究的技术体系 Establish global scale hydrology and water resources monitoring and research technology system

- 气候变化背景下水资源安全战略研究与保障技术研发 R&D of water resource security strategy research in climate change

- 加强对国际河流及周边国家和地区水文水资源特征、规律与态势的研究

Strengthen research on international hydrology, water resources features and laws of neighboring countries and regions

- 继续加强重大水资源问题的科学研究与技术研发，综合运用工程和非工程措施，积极适应气候变化，应对洪涝灾害

Adopt engineering and non-engineering measure to counter flooding

- 加强水文水资源与能源、生态、疾病与卫生、公共政策与管理、全球气候变化、国际政治等领域的交叉与融合

Improve integration of water resources, power, ecology, health, public management, global climate change and international politics

- X. 加强全方位国际合作，特别是管理的最佳实践 strengthen international cooperation at all levels, eg., best management practice



谢谢关注！

Thanks for your attention!

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