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CUWP – IWA Webinar 30/03/2021

My Understanding of the IWA Principles for Water Wise Cities

国际水协会“水智慧城市导则”之我见

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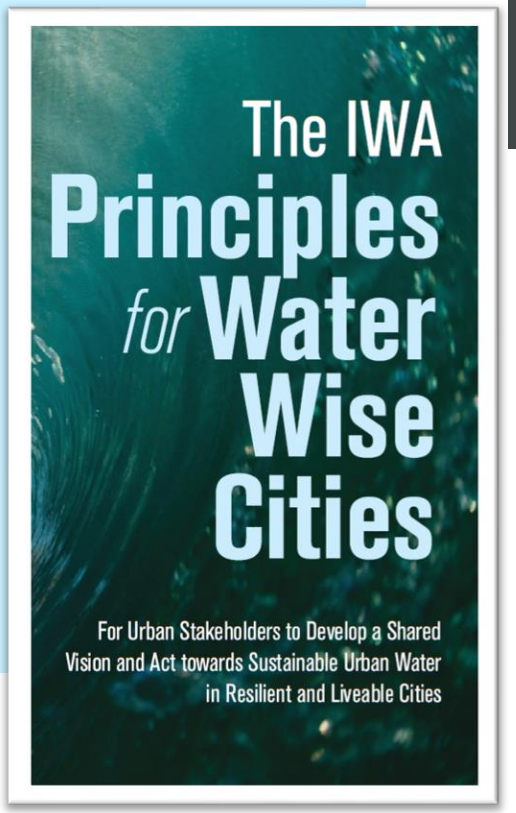
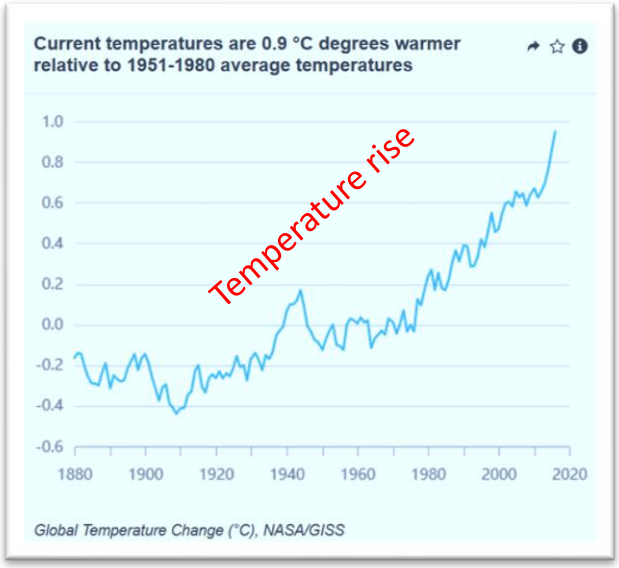


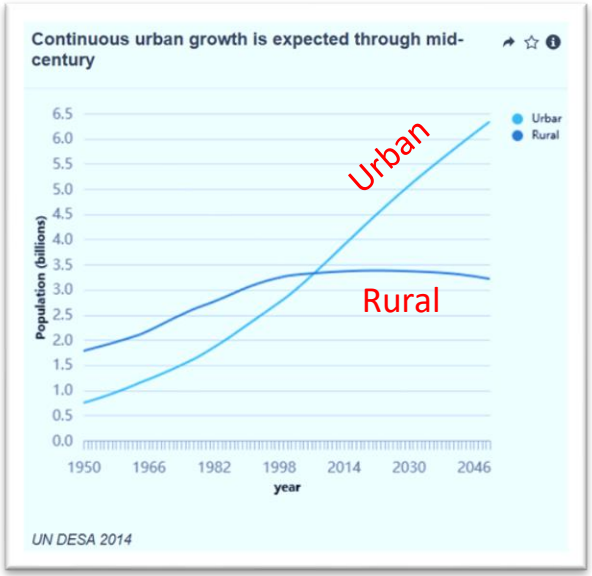
inspiring change

BACKGROUND (背景)

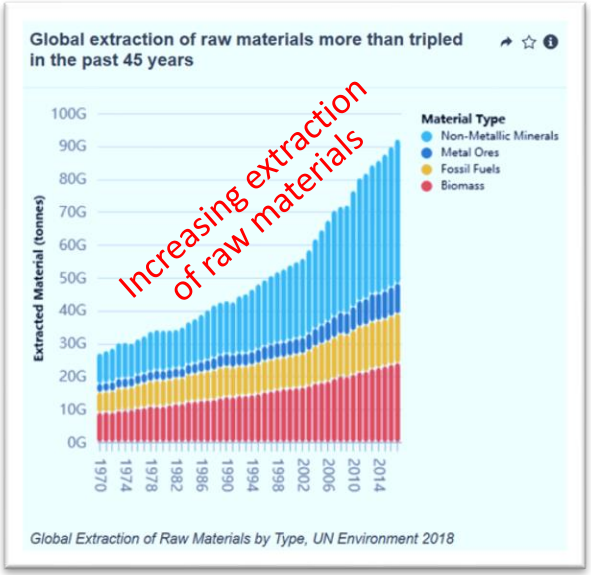
- Global Issues (全球性问题)



Climate Change
气候变化



Population Growth &
Urbanization
人口增长和城市化



Limited Resource &
Increasing Use
对有限资源的需求增大

BACKGROUND (背景)

- Urgent Needs for Paradigm Shift (亟待进行范式转换)

Old Paradigm (旧范式)		New Paradigm (新范式)
Unlimited resource prevision 无节制的资源供应	→	**Resource recovery to meet growing needs** 资源回收保障增长的需求
Economy-oriented development 经济导向型发展	→	**Economy- & livability-oriented development** 经济与宜居双导向发展
Conventional system design 传统的系统模式	→	**Sustainable system design** 可持续系统模式

IWA CoF PROGRAM & PRINCIPLES FOR WATER WISE CITIES
(国际水协会未来城市研究与水智慧城市导则)

- IWA Cities of the Future (CoF) Program (国际水协会 "未来城市研究" 计划)

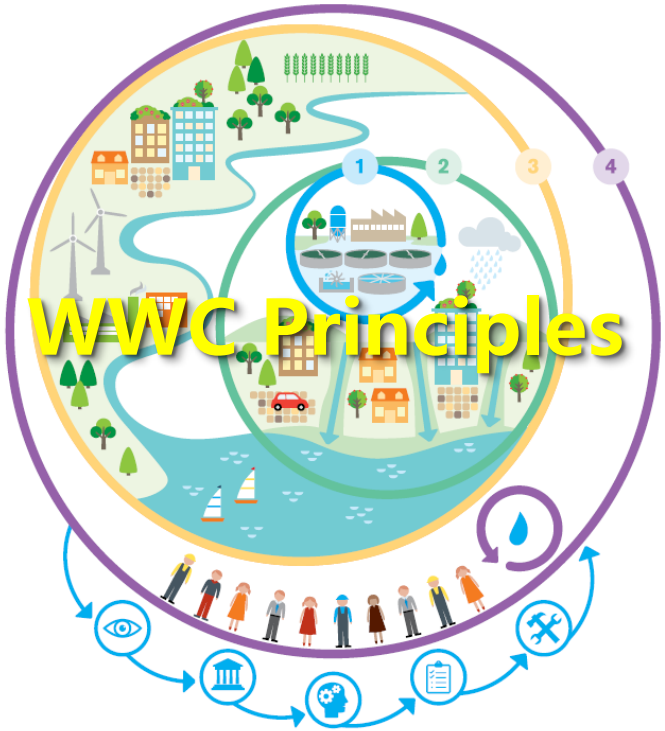
- Urgent changes needed to respond to climate change, population growth, growing resource constraints, and rapidly increasing global urbanization.
- The city of the future must integrate water management planning and operations with other city services to meet the needs of humans and the environment in a dramatically superior manner.

Launched in 2009
(2009年启动)

to meet the needs for a different approach to urban water management

IWA CoF PROGRAM & PRINCIPLES FOR WATER WISE CITIES
(国际水协会未来城市研究与水智慧城市导则)

- IWA Principles for Water Wise Cities (国际水协会 "水智慧城市导则")



5 Building Blocks
(五大基石)

4 Levels of Action (四个行动层次)

1	Regenerative Water Services	有再生力的水服务
2	Water Sensitive Urban Design	水敏城市设计
3	Basin Connected Cities	流域型城市
4	Water-Wise Communities	水智慧联盟

Vision 视野 | Governance 治理 | Knowledge & Capacity 知识与能力 | Planning Tools 规划方法 | Implementation Tools 实施方法

IWA CoF PROGRAM & PRINCIPLES FOR WATER WISE CITIES
(国际水协会未来城市研究与水智慧城市导则)

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- IWA Principles for Water Wise Cities (国际水协会 "水智慧城市导则")

The 5 Building Blocks to Deliver Sustainable Urban Water
(实现城市可持续用水的5大基石)

1. **Vision** (视野)
   - *A shared vision defining common drivers* (共同驱动力)
   - *Essential prerequisite* (先决条件)
   - *A resilient city vision* (恢复力)
2. **Governance** (治理)
   - *Institutional framework* (制度框架)
   - *Policies to provide incentives* (激励性政策体系)
3. **Knowledge & Capacity** (知识与能力)
   - *Existing knowledge, capacity & competency* (已有的知识能力)
   - *Increased knowledge, capacity & competency* (增加的知识能力)
4. **Planning tools** (规划方法)
   - Asset management (资产管理)
   - *Master plan* (总体规划)
   - *Decision support* (决策支持系统)
5. **Implementation tools** (实施方法)
   - *Regulations* (规范与规则)
   - *Financing* (投融资)
   - *Integrated services* (综合服务)
   - *Innovative instruments* (方法创新)

IWA CoF PROGRAM & PRINCIPLES FOR WATER WISE CITIES
(国际水协会未来城市研究与水智慧城市导则)

- IWA Principles for Water Wise Cities (国际水协会 "水智慧城市导则")

The 4 Levels of Actions for Building Water Wise Cities
(水智慧城市建设的四个行动层次)

1 Regenerative Water Services
有再生力的水服务

- 3 ***Rs***: Replenish, Reduce, Reuse (补水, 减量, 回用)
- Systemic approach integrated with other services (与其他服务相结合的系统方法)
- Increase the modularity (模块化服务)

2 Water Sensitive Urban Design
水敏城市设计

- Urban design for regenerative services (城市设计)
- Urban space for flood reduction (城市空间)
- Visible water for livability (有形水增加宜居性)
- Minimization of water pollution (水污染最小化)

3 Basin Connected Cities
流域型城市

- Basin to secure water resource (流域水资源保障)
- Basin to protect the water quality (流域水质保护)
- Prepare for extreme events (应对极端事件的准备)

4 Water-Wise Communities
水智慧联盟

- Citizens' involvement (市民参与)
- Professionals with various expertise(各类专业团队)
- Policy makers (决策者)
- Leaders of national and local levels (领导层)

EXISTING DIFFICULTIES & ENVISAGED SOLUTIONS (现有难题及其对策)

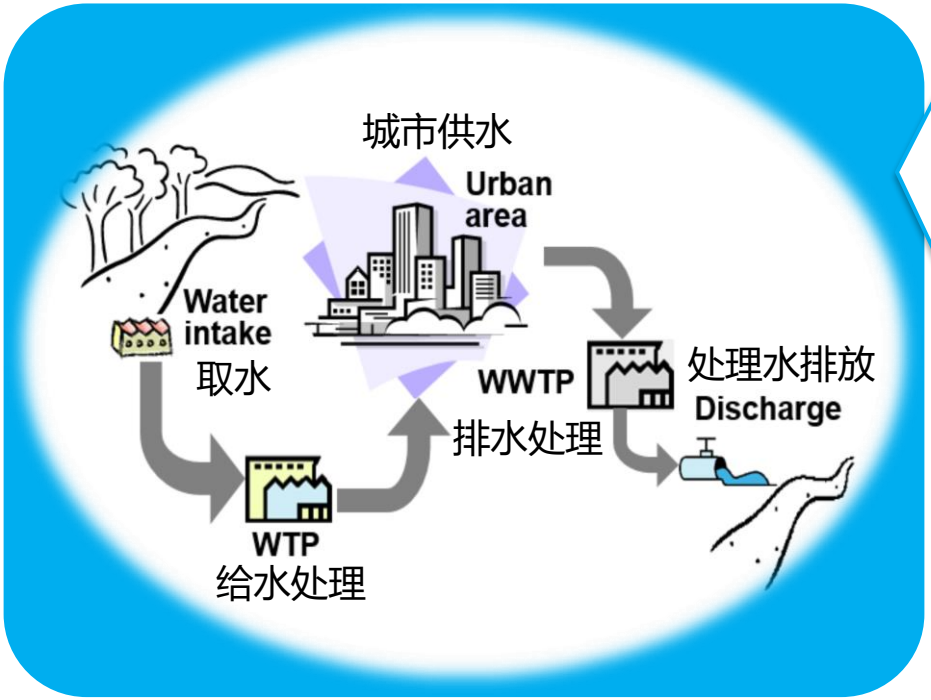
- Building water-wise cities faces various difficulties (水智慧城市建设面临的各种难题)

  - Water shortage both quantitatively and qualitatively in most of the highly urbanized areas (高度城市化地区资源型和水质型缺水)
  - Deteriorated quality of most urban waterbodies (城市水体污染)
  - Frequent urban flooding in many cities (城市内涝频发)
  - Disharmony between urban water system and other urban infrastructures (城市水系统与其他城市基础设施不协调)
  - Poor urban ecology and unfavourable living conditions (恶化的城市生态和生活环境)

EXISTING DIFFICULTIES & ENVISAGED SOLUTIONS (现有难题及其对策)

- Main reason for the existing problems (造成问题的主要原因)

✓ Conventional methodology of urban water system design no longer meets present needs (传统的城市水系统设计方法不再满足当今需求)



Characteristics (特点)

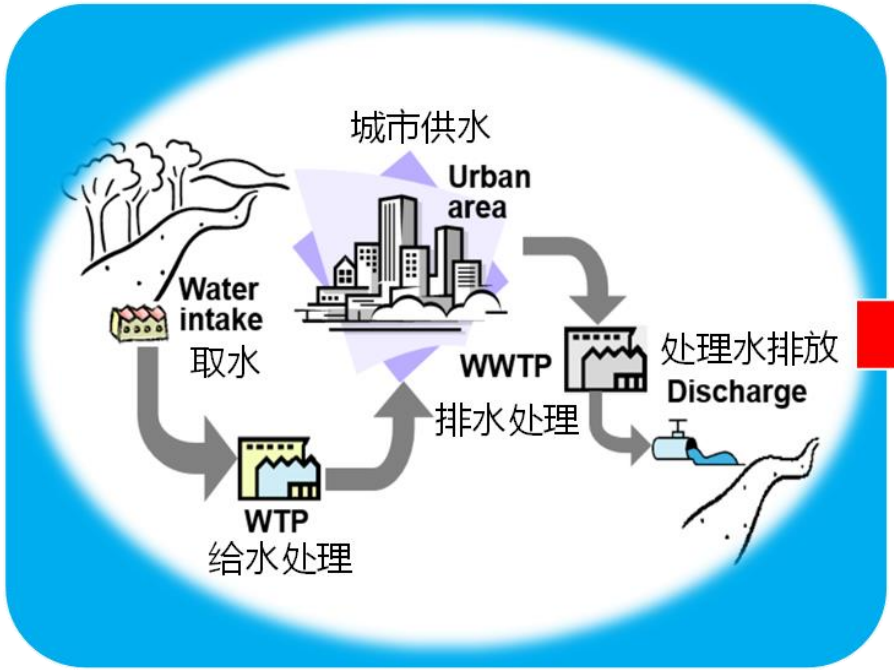
- A model born in early 1990s (一个世纪以前的系统模式)
- Sufficient supply to meet urban demand (满足城市需求的充足供给)
- An "End of the Pipe" system (直供直排系统)

Adaptable conditions (适应条件)

- Plentiful available water source (资源充足)
- Sufficient environmental baring capacity (充分的环境承载力)

EXISTING DIFFICULTIES & ENVISAGED SOLUTIONS (现有难题及其对策)

- Direction for change (变革的方向)



Current Paradigm:
Engineering Dependent
(当前范式：工程依赖性)

Future Paradigm:
Engineering in Nature
(未来范式：工程融于自然)

EXISTING DIFFICULTIES & ENVISAGED SOLUTIONS (现有难题及其对策)

- Solutions following the ***WWC Principles*** (基于水智慧城市导则的对策)

Integration of urban systems and services (集成化城市系统设计)

Provision of alternative sources in basin scale (流域规模替代源的提供)

→ Systematic solutions (系统解决方案)

Urban water and energy saving (城市节水节能)

Resource recovery, recycling and reuse (资源回收、循环与再利用)

Provision of sufficient urban water spaces (提供足够的城市水空间)

→ Water shortage and flood control countermeasures (缺水与防涝对策)

EXISTING DIFFICULTIES & ENVISAGED SOLUTIONS (现有难题及其对策)

- Solutions following the ***WWC Principles*** (基于水智慧城市导则的对策)

Watershed management and source protection (流域管理与水源保护)

Utilization of environment-friendly urban materials (环保型城市建材利用)

→ Pollution control countermeasures (水污染控制对策)

Provision of visible urban water (提供可见的城市水体)

Enable regenerative water services (提供有再生力的水服务)

Water-related resilient urban design (涉水弹性城市设计)

→ Countermeasures to enhance livability (宜居性改善对策)

EXISTING DIFFICULTIES & ENVISAGED SOLUTIONS (现有难题及其对策)

- Solutions following the ***WWC Principles*** (基于水智慧城市导则的对策)

Citizens' awareness and participation
(公民意识与参与)

Transdisciplinary professionals' collaboration
(跨学科专业人员的通力合作)

Correct policy making for water-wise cities
(正确的水智慧城市决策)

Leaders for effective and efficient governance
(领导者的高效管理)

Human resources and capacity guarantee
(人力资源和能力保障)

WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

- North America: Low Impact Development (LID) as main solutions (北美：以低影响开发为主要对策)

Characteristics

- Stormwater runoff management as part of green infrastructure (雨水径流管理是绿色基础设施的核心)
- Project based (依托工程项目)
- Decentralized (分散式设施)

Main measures

- Pre-treatment (预处理)
- Filtration (过滤处理)
- Infiltration (下渗)
- Storage and reuse (存储与回用)

Five principles

- Conserve natural areas wherever possible (自然现状的最大限度维持)
- Minimize the development impact on hydrology (对水文过程影响最小)
- Maintain runoff rate and duration from the site (维持径流率及其历时)
- Scatter integrated management practices throughout the project site (分散集成管理实践)
- Implement pollution prevention and proper maintenance (污染控制管理)

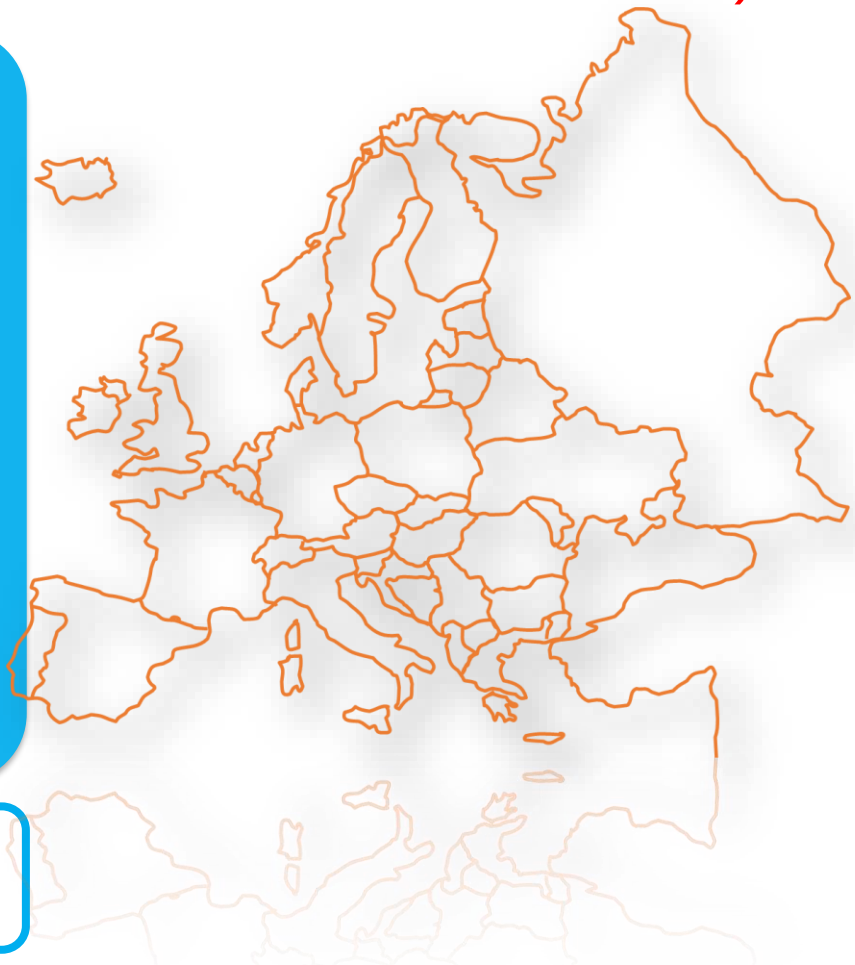
WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

- Europe: Combining with Sustainable Urban Drainage Systems (SUDS) (欧洲：与可持续城市排水系统建设相结合)

SUDS Techniques

- Source control (源头控制)
- Permeable paving such as pervious concrete (透水性铺装，如透水混凝土)
- Stormwater detention (雨水滞留)
- Stormwater infiltration (雨水入渗)
- Evapotranspiration (蒸发蒸腾)

Drainage system + Green infrastructure (排水系统+绿色基础设施)



WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

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- Europe: Combining with Sustainable Urban Drainage Systems (SUDS) (欧洲：与可持续城市排水系统建设相结合)

A city in the low-lying delta

City scale robust water infrastructure for control of flood risks and water quality

(水基础设施提供城市防洪和水质保障)

Combined with circular economy – energy and resource recovery and recycling from all waters

(能源和资源回收为标志的循环经济模式)

A new vision of ***Co-Create Copenhagen*** as a liveable and responsible city

("共同创造哥本哈根" 的新愿景)

Affordable housing in a dense urban center and flood proof infrastructure and drainage

(城市中心的经济适用房和防洪排水基础设施)

A city with limited available land

A city built in a low-lying swamp area

The ***City Planning Authority*** has been mandated to coordinate climate adaptation

(城市规划当局授权协调应对气候变化)

Building of ***Green Gothenburg*** through wide collaboration

(广泛合作打造绿色哥德堡)

Masterplan for Territorial Coherence – to develop the city around its water resources

(围绕水资源城市开发的区域一致性总体规划)

Redevelopment of natural flooding areas to offer water source and wetland network

(开发天然洪泛区提供水源和湿地网络)

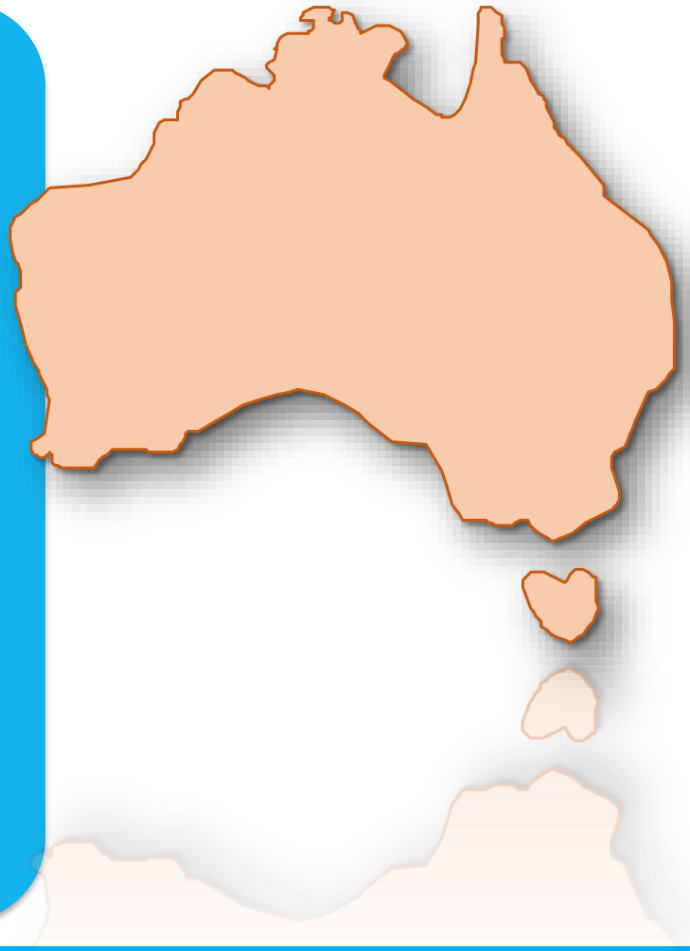
A city that lives with water

WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

- Australia: Water Sensitive Urban Design (WSUD) (澳洲：水敏城市设计)

WSUD Measures

- Road layout and streetscape: Bioretention systems, infiltration trenches and systems, sand filters, porous paving (道路布局和街道景观：生态集流系统，渗透沟渠和系统，砂过滤器，多孔铺装)
- Public open space: Sedimentation basins, constructed wetlands, swales and buffer strips, ponds and lakes (公共开放空间：沉积盆地、人工湿地、沼泽和缓冲带、池塘和湖泊)
- Water re-use: Rainwater tanks, aquifer storage and recovery (水回用：雨水箱、地下蓄水和利用)



WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

- Australia: Water Sensitive Urban Design (WSUD) (澳洲：水敏城市设计)

Common Problems and Goals (共同问题与目标)

Floods, droughts & variable climatic conditions (洪水、干旱和多变的气候条件)

Resilient, cool, green & productive cities (弹性、凉爽、绿色和生产型城市)

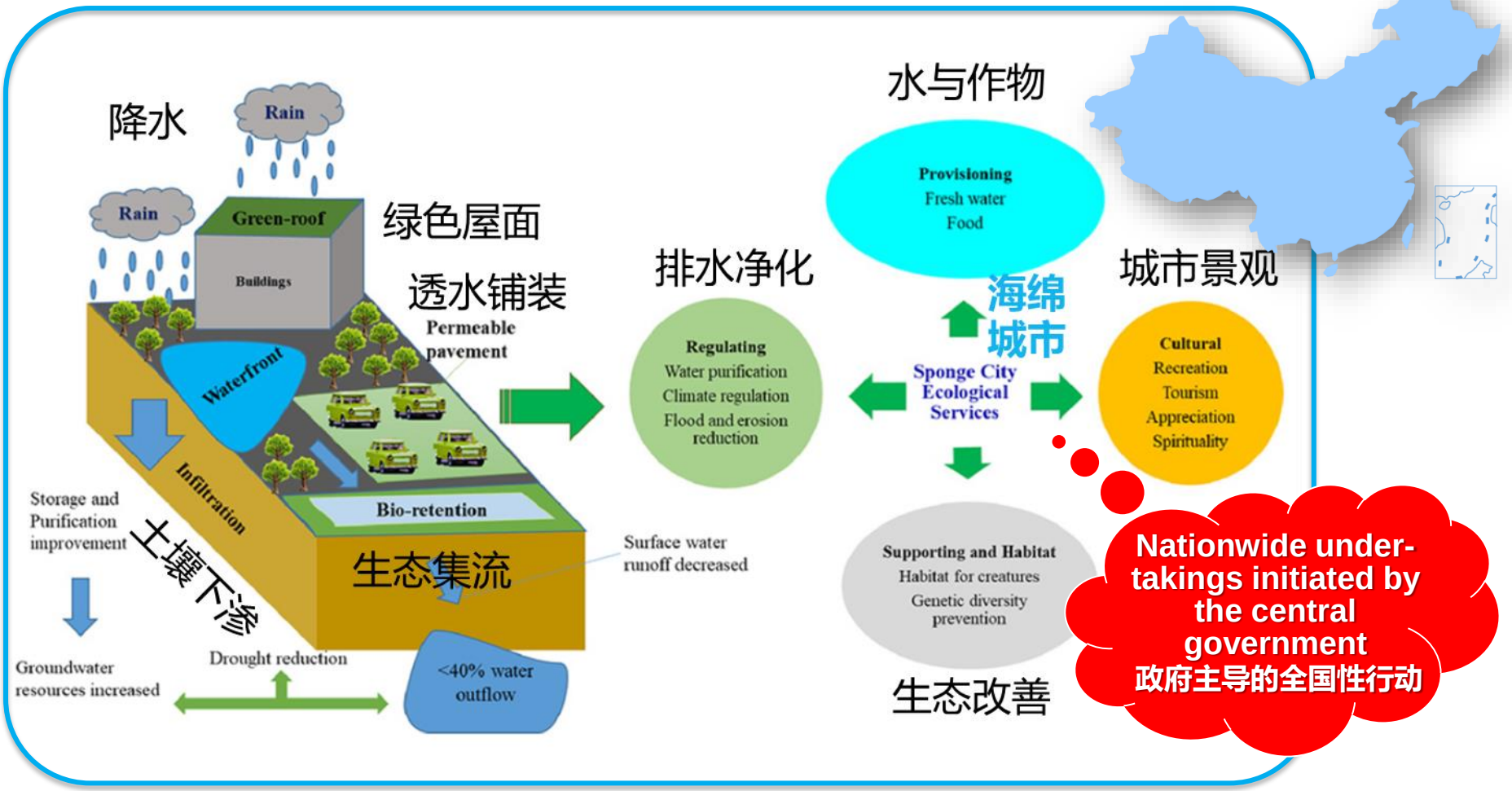
- Greater emphasis on alternative water supplies and water saving (替代性供水和节水)
- Increasing permeability and soil moisture (提高渗透性和土壤湿度)
- To create a city within a forest rather than a forest within a city (在森林中创建城市而不是在城市内创建森林)

- To maintain the potable water use to a low level and to capture alternative water sources (保持饮用水使用量低水平并开发非传统水源)
- Floodplain Risk Management Plan for floodwater drainage and harvesting (漫滩洪水排涝风险管理规划与实施)

- To achieve a vision of a clean and green city (实现清洁绿色城市的愿景)
- To ensure secure, healthy and sustainable water resources (水资源安全健康与可持续保障)
- To increase the use of natural assets for flood and sea level rise (增加自然资源使用，应对洪水和海面上升)

WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

- China: Sponge City Initiative (中国：海绵城市建设)



WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

- China: Sponge City Initiative (中国：海绵城市建设)

Main Challenges

- A low-lying city with the risk of frequent inundation (低洼地城市，内涝风险性高)
- Increasing population (人口持续增长)
- Growing concern for water quality and security (水质和供水安全问题广受关注)

Main Solutions

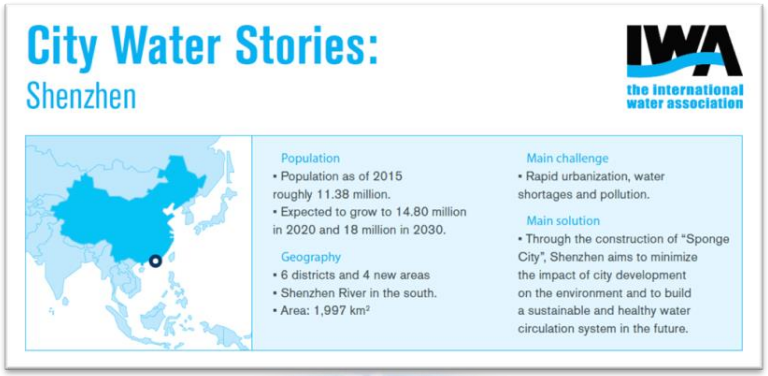
- The city as a catchment for water supply (城市作为供水的集水区)
- Minimization of stormwater discharge through Sponge City measures (通过海绵城市建设降低雨水排放量)
- Cross-sectional governance (跨部门综合治理)

Kunshan Culture Plaza Wetland (昆山文化广场湿地)

In the Kunshan Culture & Art precinct, water sensitive design is being implemented through constructed wetlands integrated into the public landscape – a public open space with clean water to provide ecosystem services (昆山文化艺术区，通过人工湿地整合到公共景观之中实现水敏设计，清洁碧绿的亲水性公共开放空间为市民提供良好的生态系统服务)

WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

- China: Sponge City Initiative (中国：海绵城市建设)



Main Challenges

- Rapid growth into a modern metropolis over 11 million residents (快速发展的现代化特大城市)
- Shortage of local resources including water (当地资源匮乏)
- Reduced environmental capacity and serious water pollution (环境容量骤减，水污染严重)

Main Solutions

- Sponge city measures to minimize the impact of urban development (通过海绵城市建设降低城市发展的影响)
- Implementation of five-year plan for flood control and water improvement (实施防洪治水五年计划)
- Building of sustainable water circulating system (可持续水循环系统建设)

Futian River Ecosystem (福田河生态系统)

Futian River, running through the central city, is being built as a liverable urban ecosystem by sewage management and a combination of water reuse and wetland purification system

(贯穿中心城区的福田河，通过污水处理、水回用和湿地净化系统的结合，正在建设成为宜居的城市生态系统)

WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

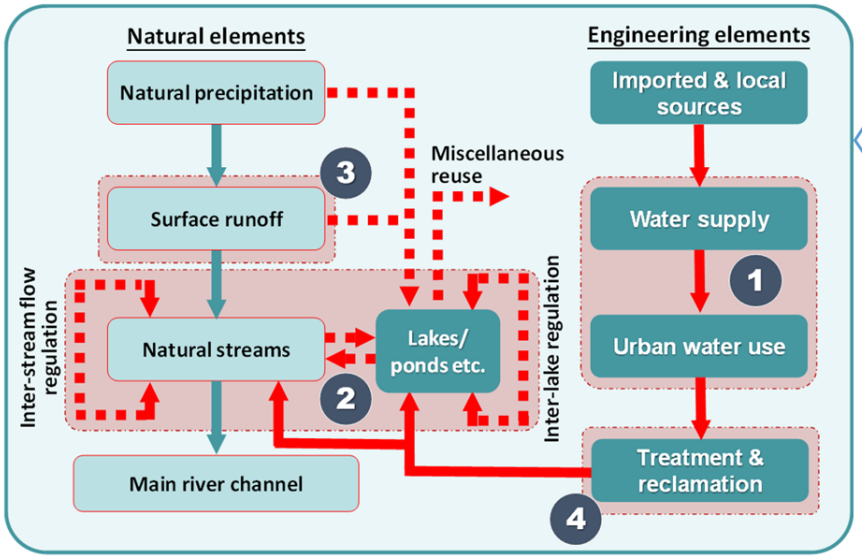
- China: Sponge City Initiative (中国：海绵城市建设)

- Ancient capital city (著名古都)
- Water shortage problem (缺水)
- Source enlargement from water cycle management (水循环管理实现资源扩充)

Water Cycle Management (水循环管理)

- To maintain the hydrological cycle as it is, as far as possible (最大限度维持水文循环过程的自然属性)
- To follow the nature's manner, as far as possible, in system design and technology selection/integration (尽可能依照自然法则进行系统设计、技术选择与集成)

Concept of Water Cycle Management (水循环管理的理念)



A quasi-natural water cycle with
1. Water saving
2. Multi-functional and cascading water use
3. Rainwater harvesting
4. Water reclamation

as ***four pillars*** to support integrated water management

拟自然水循环的四要素：
- 城市节水
- 多目的梯级水利用
- 雨水收集利用
- 污水再生回用

WORLDWIDE CASES AND EXPERIENCES (各国案例及经验)

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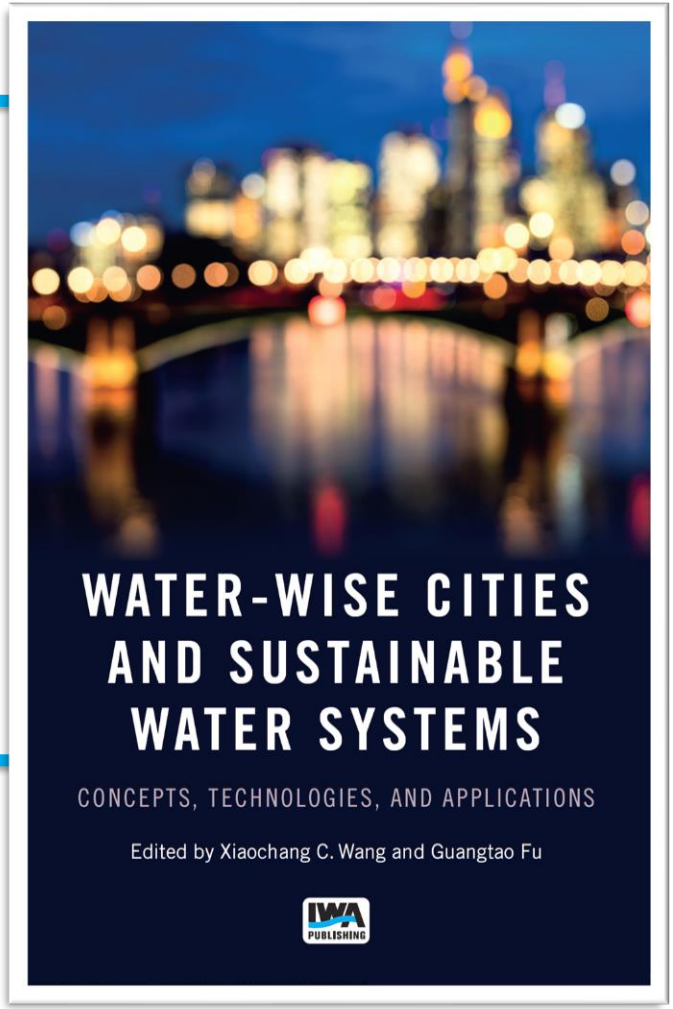
- A Book Recently Published by IWAP (国际水协出版社今年出版的新书)

Water-Wise Cities and Sustainable Water Systems: Concepts, Technologies, and Applications

水智慧城市和可持续水系统：概念·技术及应用

Edited by
Xiaochang C. Wang and Guangtao Fu



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CONCLUDING REMARKS (结语)

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- Climate change, population growth & urbanization, and increasing demand for resource supply are stimulating a paradigm shift in urban waster system design (气候变化、人口增长和城市化带来资源需求增大激励着城市水系统设计范式的转变)

- "The IWA Principles for Water Wise Cities" is formulated on the basis of global experiences such as LID, SUDS, WSUD and Sponge City practices (国际水协会 "水智慧城市导则" 是基于世界各国多方面的实践经验提出的)

- Faced with common and specific problems in various countries and regions, international exchanges are extremely important toward the future (面对各个国家和地区面临的共性问题和特定问题，国际合作和交流将越来越重要)