



中丹战略行业合作项目进展

The Progress of Sino-Danish Strategic Sector Cooperation Program on Water and Environment (SSC I)

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- 1 项目简介 Introduction**
- 2 项目成果 Results**
- 3 经验总结 Experience learnt**

■ 面临挑战: Challenges of Water Resources

China

Water resources distribution pattern is affected by geography and monsoon. Rainfall distribution across the nation, rich in south and east.

- **Frequent Water Disasters**
- **Water Shortage**
- **Ecological Damage**
- **Water Pollution**

Denmark

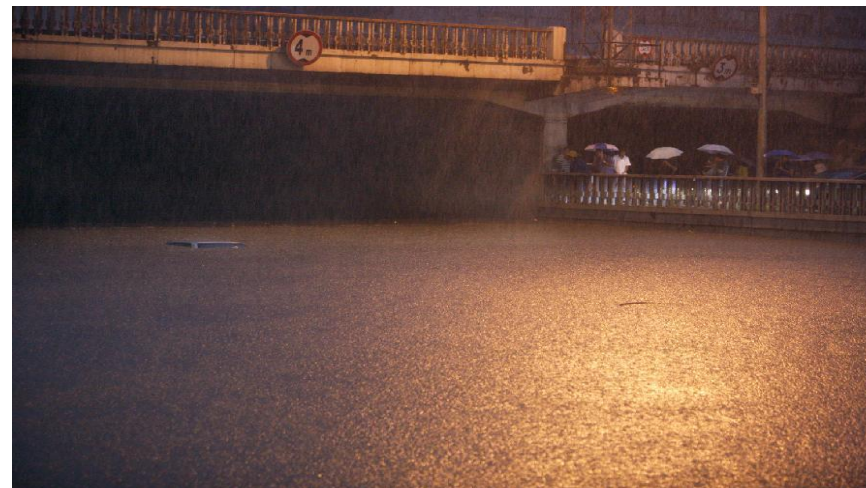
Denmark has a temperate maritime climate with an annual average precipitation is 792mm. 100% drinking water is from groundwater.

- **Climate change**
- **Urban flooding**
- **Environmental protection**

1 项目简介 Introduction



China



Groundwater over exploitation

- Average annual GW over-exploitation 7.2 billion m³
- Jing-Jin-Ji Area: 20 depression cones, area of 70 thousands km².
- Comprehensive remediation plan of groundwater over-exploitation in the Hebei Province

Serious flood disaster

- More than 90% of the population and 2/3 of the land area are threatened by floods .
- Since 1949, nearly 70 major floods have occurred.
- The direct economic losses account for 65% of natural disaster losses.
- Urban flooding becoming more serious.

■ 项目目标: Objective of SSC Project

SSC Proposal – August, 2016

SSC Water and Environment,
China

Final

12.08.2016

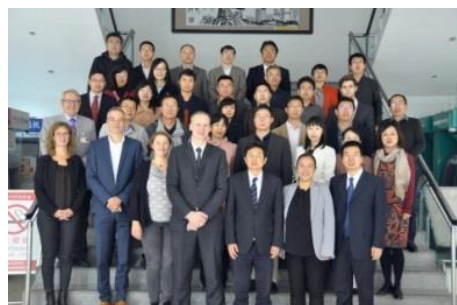
- Denmark's advanced experience in **groundwater protection** and **flood management**.
- 2-3 Years, **knowledge exchange**, **personnel exchange visits**, and **pilot project capacity building**.
- **knowledge accumulation** and **capability improvement** on water resources management.

1 项目简介 Introduction



■ 技术研讨和培训: Seminar and training

8 Seminar/training **300** participants



Start-up, Beijing,
2016.10



WR1, Nanjing,
2016.12



WR2, Aalborg,
2017.03



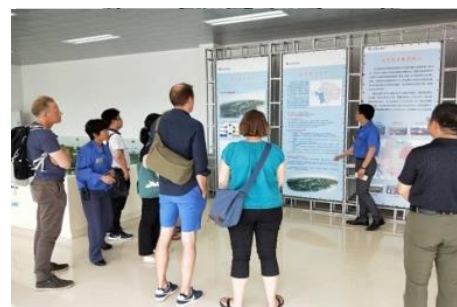
WR3, Fujian, Tianjin,
2017.06



WR4, Beijing,
2017.11



WR5, Copenhagen,
2018.04



WR6, Beijing,
2018.06



Conclusion, Beijing
2018.09

■ 合作伙伴: Partners

Joint steering committee of SSC

➤ Ministry of Water Resources, China

- IWHR
- Hydrological Bureau of CWRC
- HRWC
- NHRI
- Hydrological Bureau of Liaoning
- Department of Water Resources of Zhejiang
- Department of Water Resources of Fujian
- Ji nan Water Affairs Bureau.

➤ Ministry of Environment and Food, Denmark



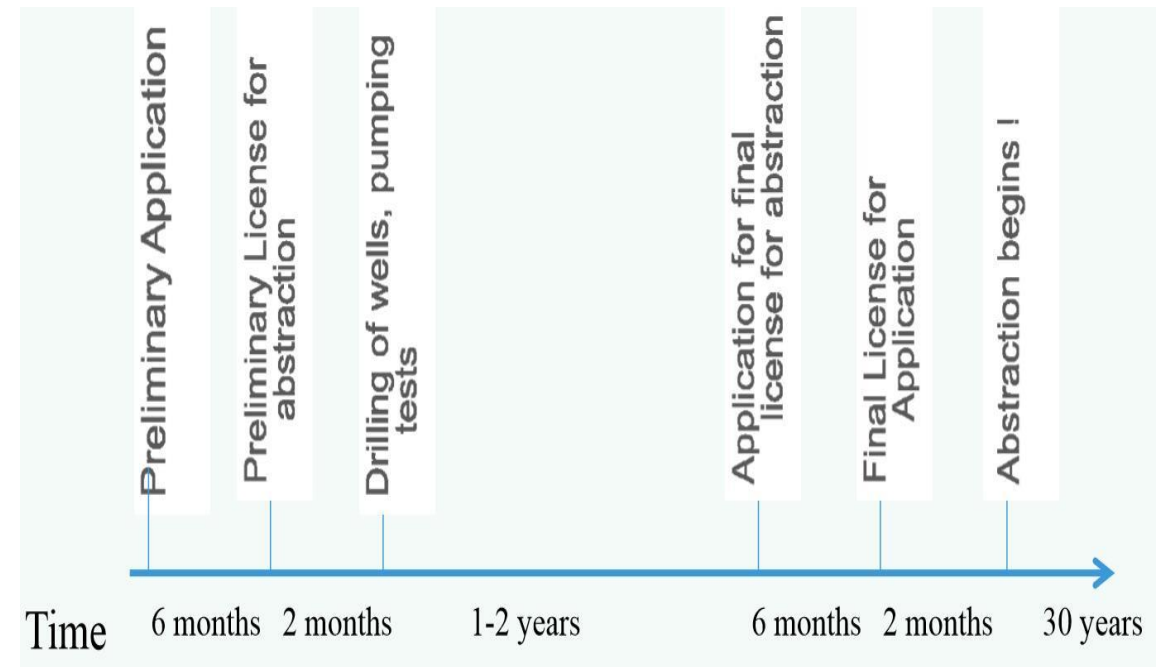
Secretariat of SSC

Policy and system of groundwater management **Denmark**

Policies and regulations

- EU Water Framework Directive
- EU Groundwater Directive
- Law of Groundwater Protection
- Environmental Protection Act
-

Implementation and management

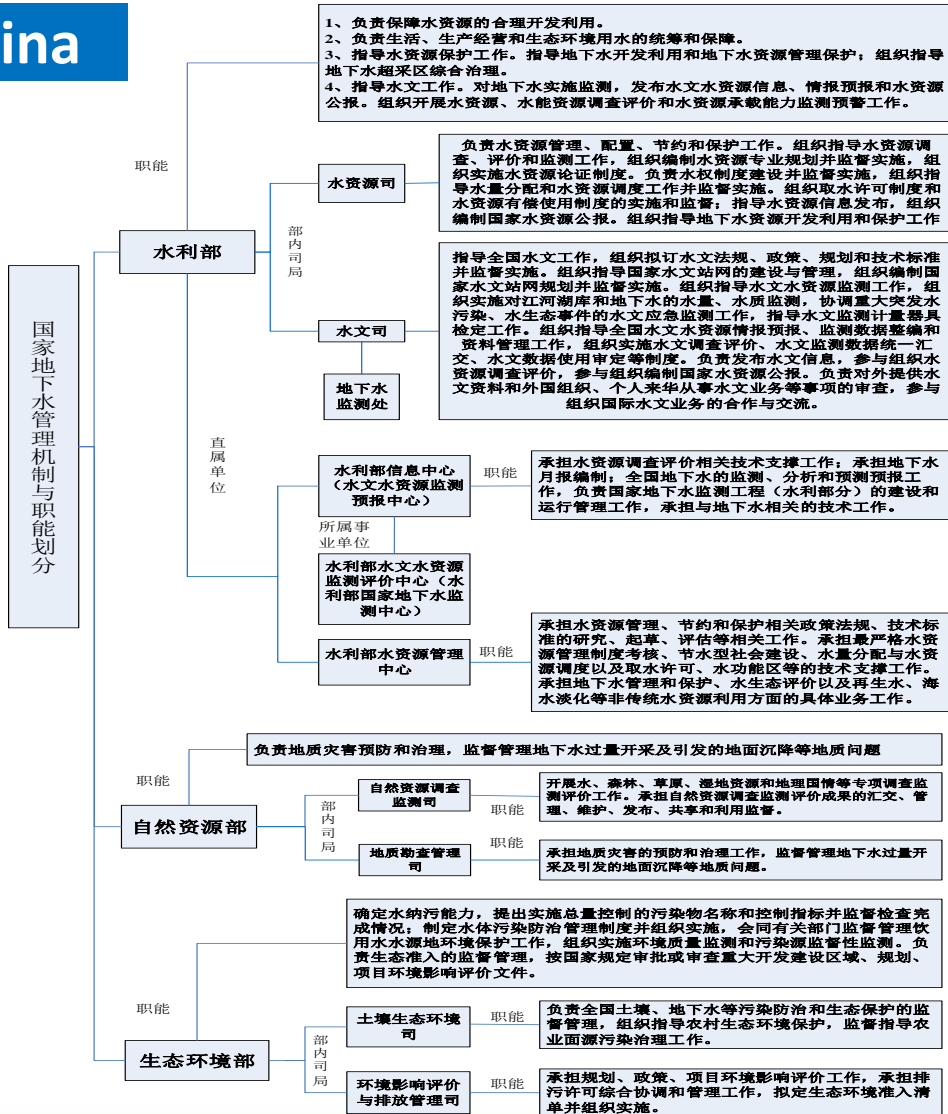


Time Flow of the License for Abstraction

2 项目成果 Results



China



Experience and suggestions

- Lack of special laws and lack of effective coordination between laws.
- Insufficient institutional response to the impacts of new water supply forms on groundwater.

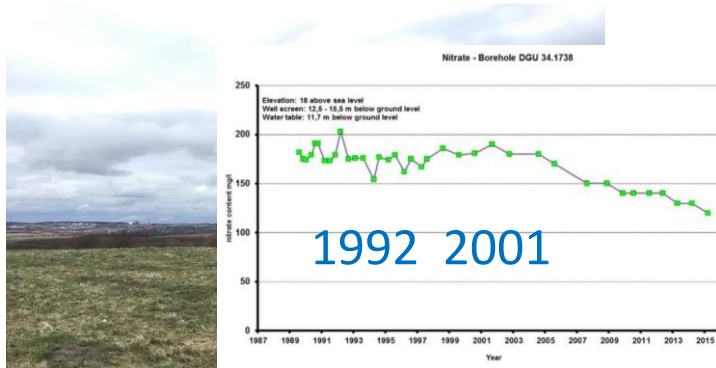
2 项目成果 Results



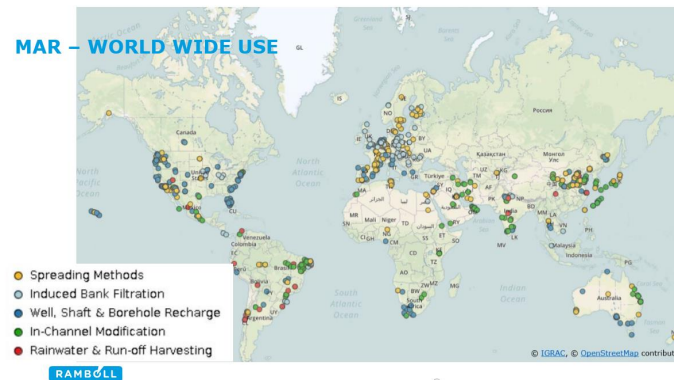
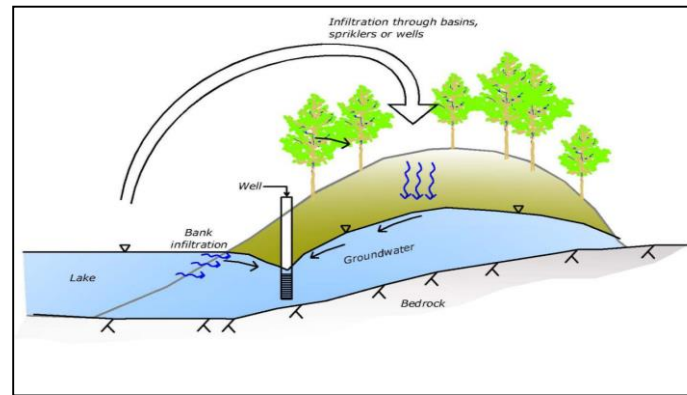
Groundwater management idea and technology

Prevention of Groundwater Problems

- Saltwater intrusion
- Surface subsidence
- Groundwater quality
- Well abstraction quantity
- Groundwater management



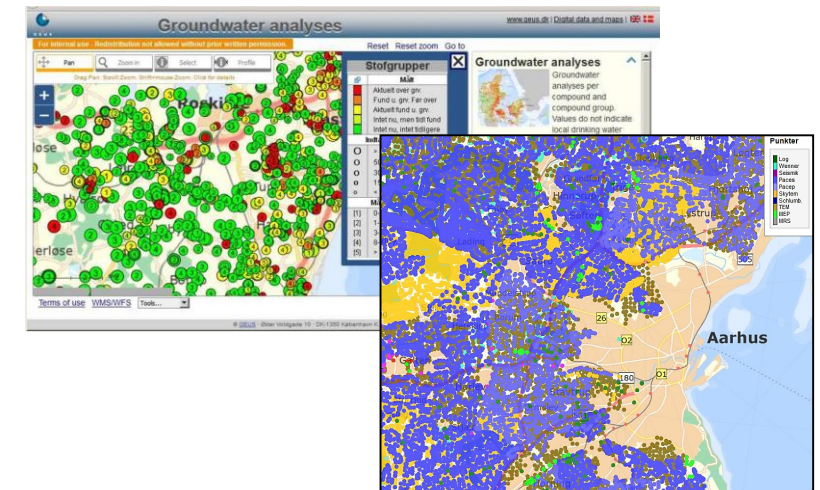
Concept of MAR



Denmark

Data management

- Jupiter database (well and waterworks data)
- GERDA database (geophysical data)
- Danish Environmental Portal



Drastrup Catchment Preservation Area

2 项目成果 Results



China

- Groundwater monitoring
- Groundwater overdraft areas
- Artificial replenishment of groundwater
- Utilization of brackish water
- Groundwater reservoir construction



Dynamic Investigation and Evaluation of Groundwater in Large Plains (Basins)

Experience and suggestions

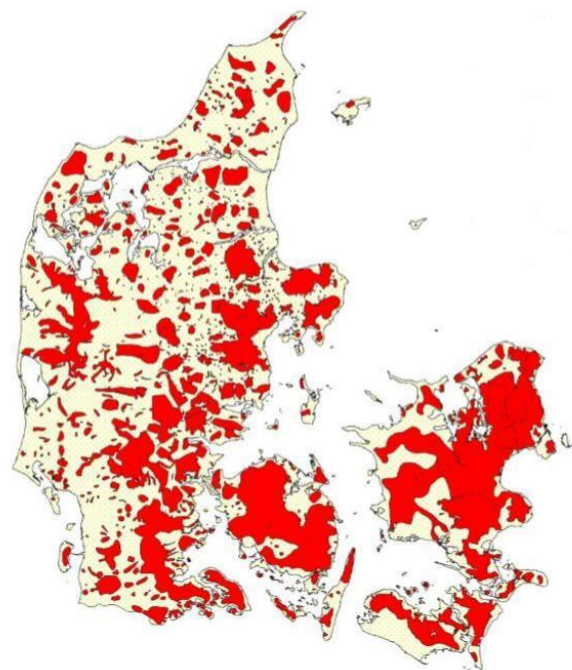
- Improvement the density of the monitoring network
- Strengthening the data sharing mechanism
- Improvement the information service
- Application and management of Managed Aquifer Recharge (MAR)

2 项目成果 Results



Groundwater modeling

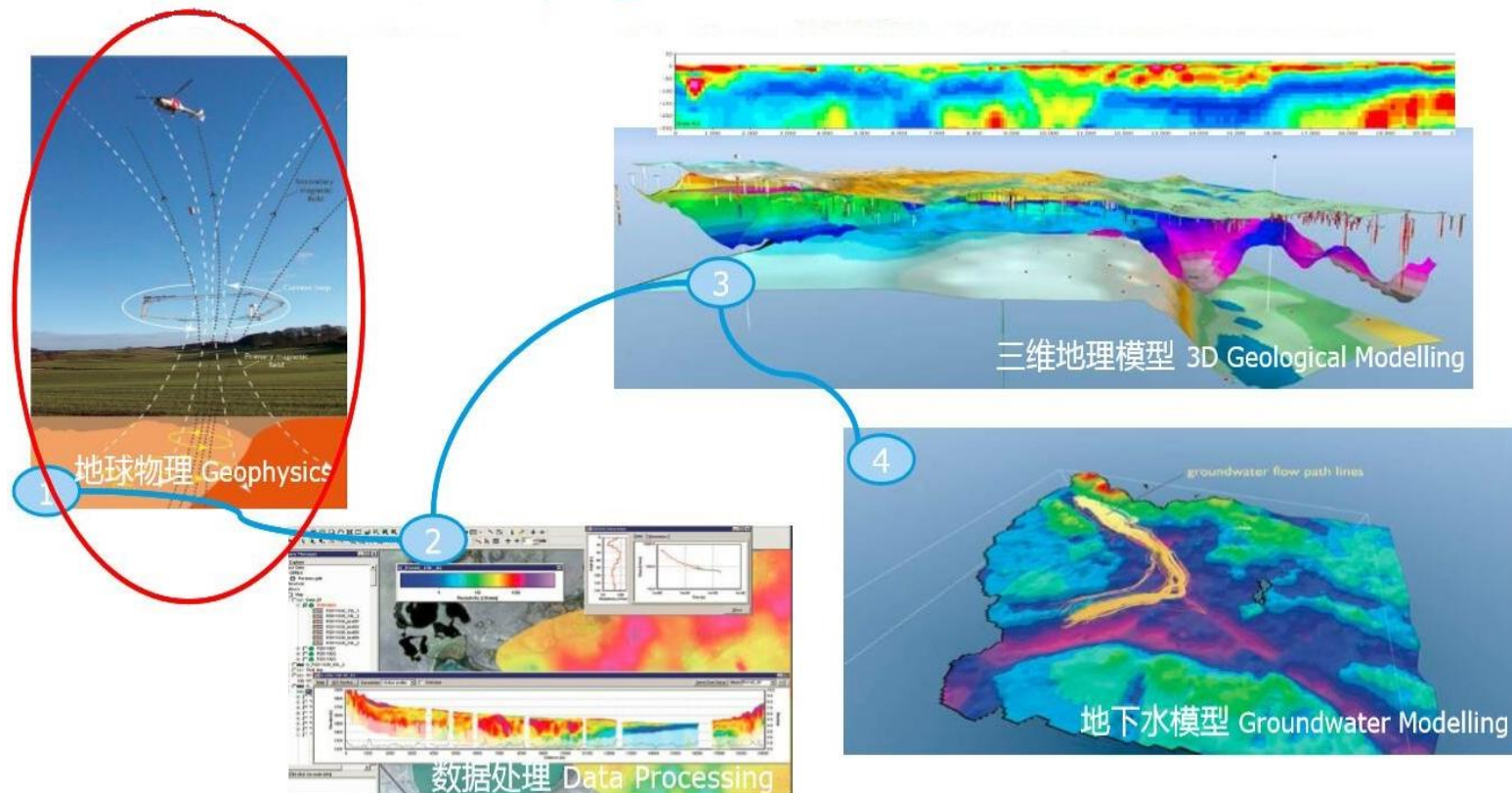
Methods of mapping



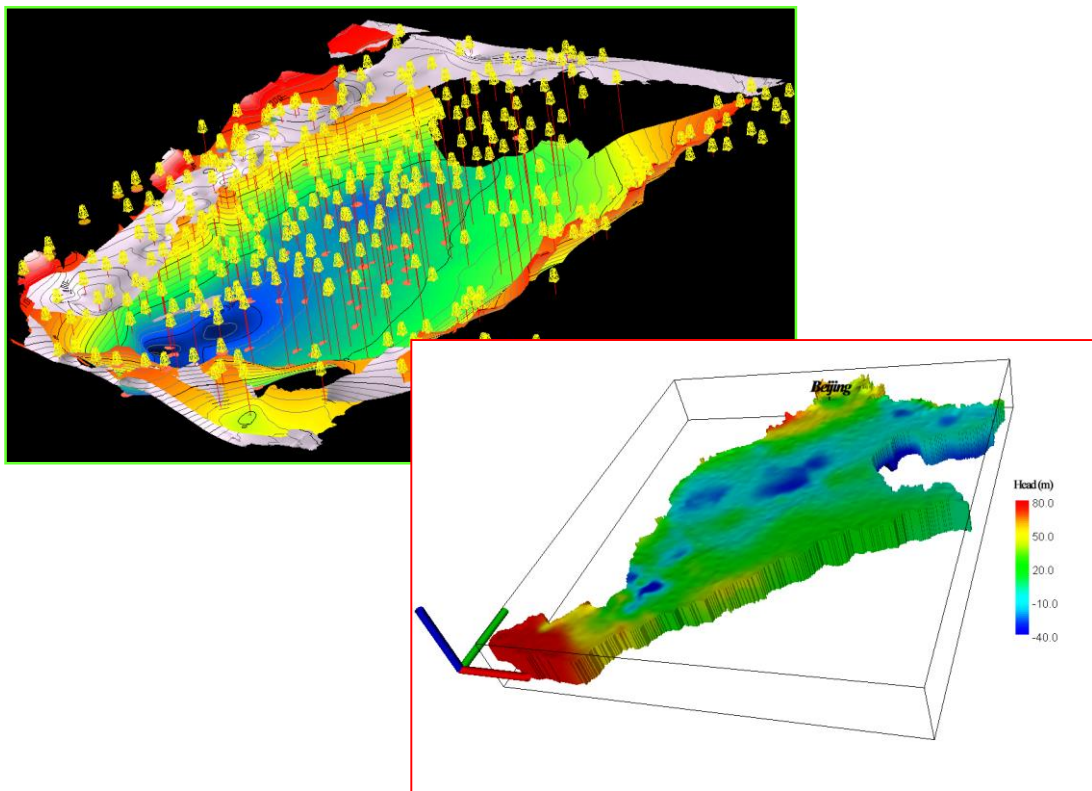
First Country: Danish Groundwater Mapping Distribution

Denmark

Groundwater modeling: MIKE-SHE



China



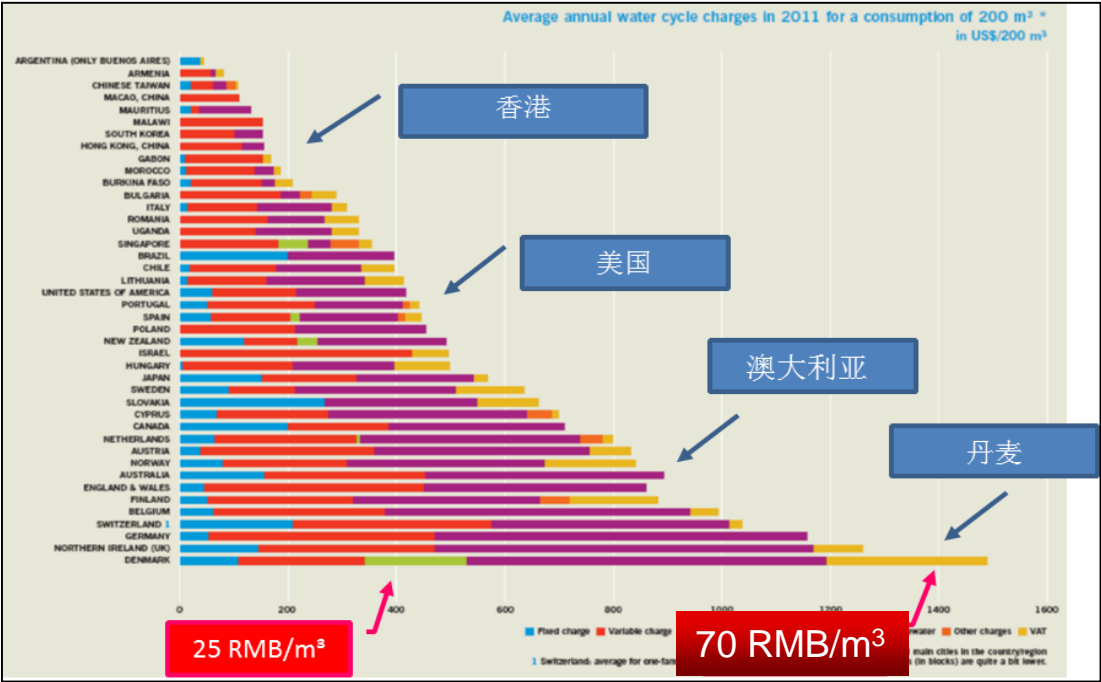
Experience and suggestions

- Promoting the application of models in practice level
- Scientific problems
 - 1、 Evolution and development trend of groundwater environment
 - 2、 Groundwater circulation and sustainable utilization of groundwater resources
 - 3、 Relationship between human activities and groundwater environment

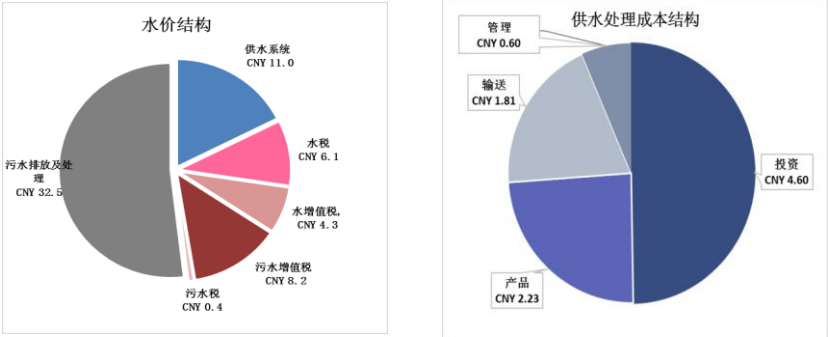
2 项目成果 Results



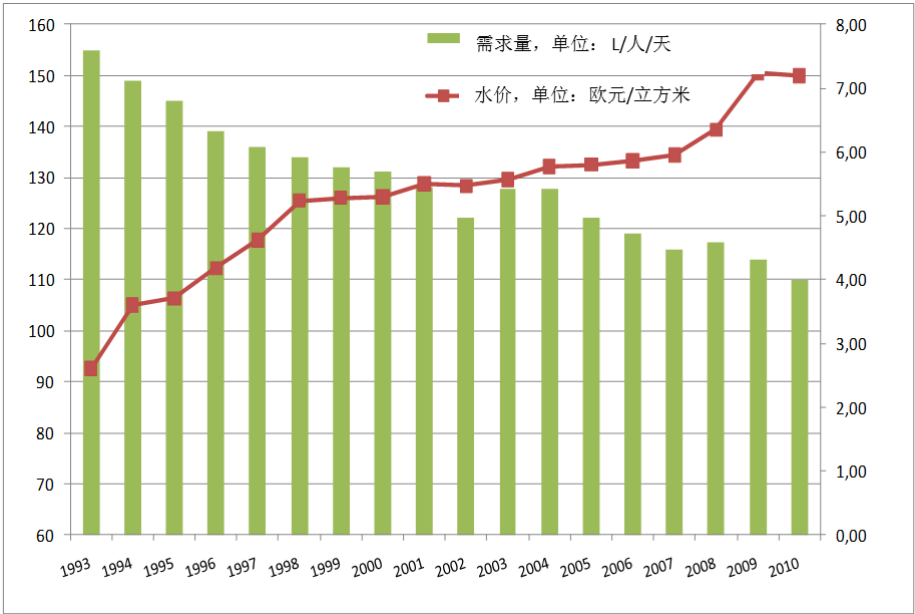
Water supply price Denmark



Global Water Price Composition



Water Price Structure and Water Treatment Cost



China

- Municipal water price
- Agricultural water price
- Water price of the South-to-North Water Diversion Project
- Reform of water resource tax

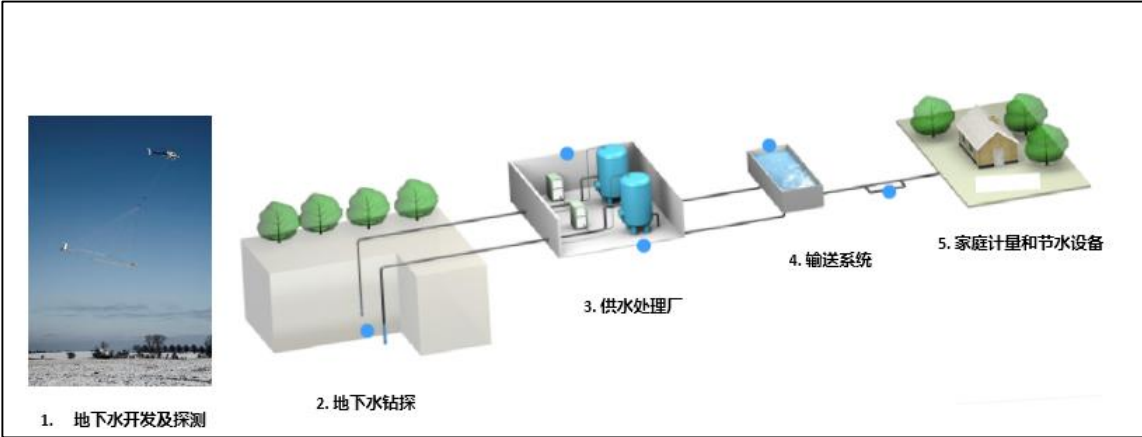
Grade	Yearly Water Consumption / Household (m ³)	Water Price	Inc.		
			Tap Water Fee	Water Resource Fee	Sewage Treatment Fee
I	0-180 (contained)	5.00	2.07	1.57	1.36
II	181-260 (contained)	7.00	4.07		
III	Above 260 (contained)	9.00	6.07		

Experience and suggestions

- Learn the history of water price reform in Denmark.
- Deepening reform and innovation, and improving policies and measures.
- Promoting water resource tax reform coordinately.

Integrated Water supply management

Denmark

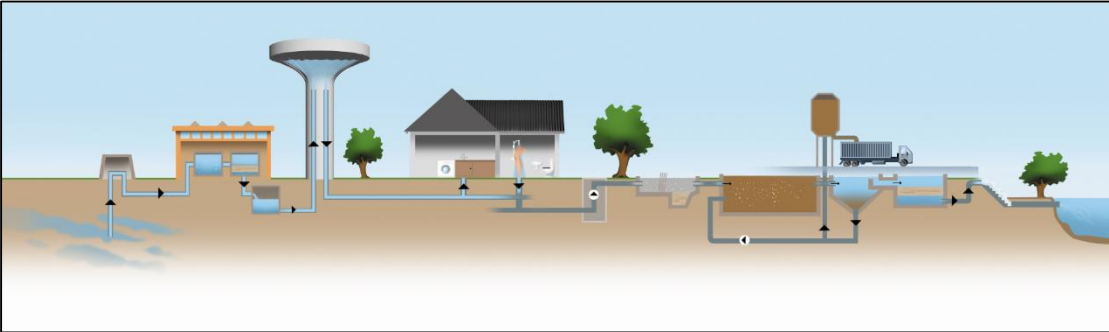


Municipal Water Supply and Wastewater Treatment in Denmark I

Leaking management



System input volume (corrected for known errors)	Authorised consumption	Unbilled consumption	Billed metered consumption (including water exported)	Revenue Water
			Billed unmetered consumption	
Water losses	authorised consumption	Apparent losses	Unbilled metered consumption	Non-Revenue Water (NRW)
			Unbilled unmetered consumption	
			Unauthorised consumption	
	Real losses	Real losses	Customer metering inaccuracies	
			Leakage on transmission and/or distribution mains	
			Leakage and overflows at Utility's storage tanks	
			Leakage on service connections up to point of consumer metering	



Municipal Water Supply and Wastewater Treatment in Denmark II



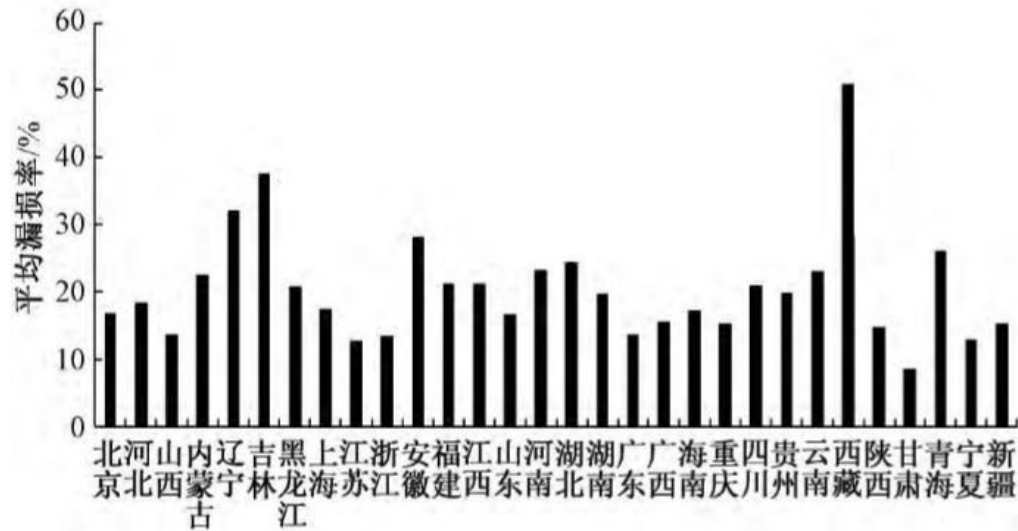
Underground River Course-Sponge City Design Concept

2 项目成果 Results



China

- Urban water supply
- Rural water supply



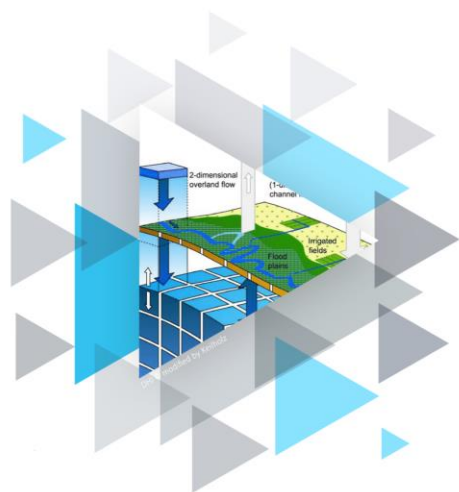
Leakage percentage of each province in
China, 2010

Experience and suggestions

- Reasonable control over the cost, integrate resources and improve efficiency for enterprises , governments
- Technology upgrading should be conducted
- Establishing a real-time monitoring management system, Strengthening metering management, leakage management and marketing management teams.

■ 地下水建模指南: Groundwater Modeling Guideline

Groundwater Modeling Guideline

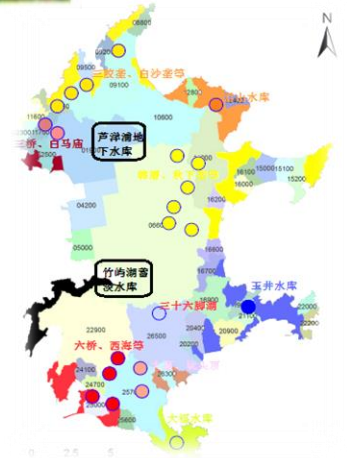
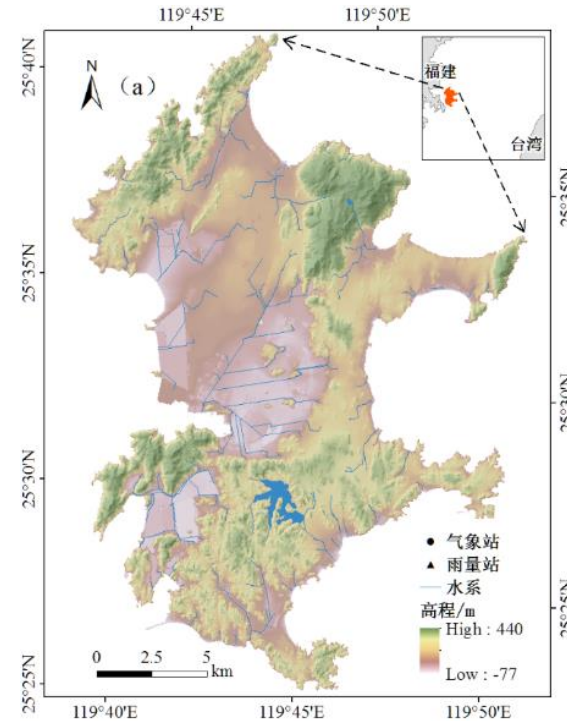


- Establish groundwater models with respect to data requirement and general procedure
- Support water resources assessment and groundwater balance analysis in groundwater resources management
- Groundwater modeling application: **data requirement, modeling process and other conventional technical problems** rather than the more complicated groundwater simulation issues.

2 项目成果 Results

Efficient utilization of rain-flood resources of Pingtan Island, Fujian Province

- Island rain-flood resources assessment technology
- Establishing an island rain-flood storage system
- Establishing an island-wide rain-flood dispatch and utilization system
- MAR test



2 项目成果 Results



Former Minister Jakob Ellemann-Jensen
Former Ambassador A.Carsten Damsgaard
2018.09 visited IWHR.

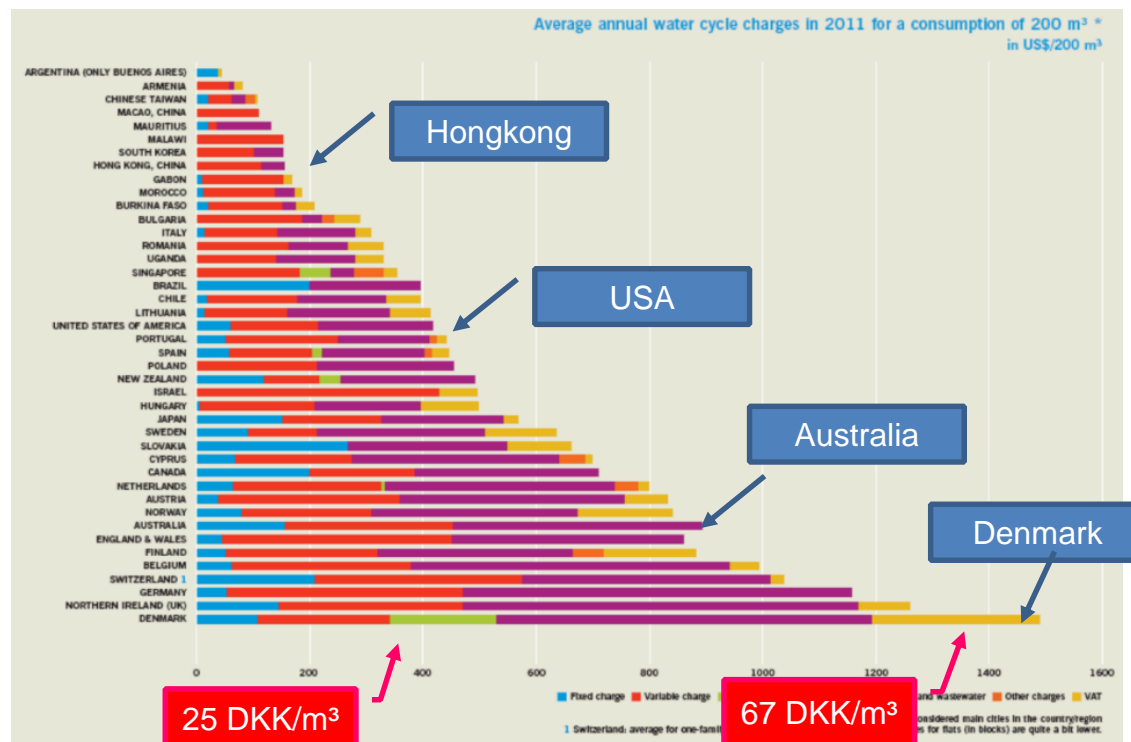


3 经验总结 Experience learnt



■ 以经济杠杆为手段，大力促进全社会节水 Economic leverage – promoting water conservation

Denmark has the highest water price in the world

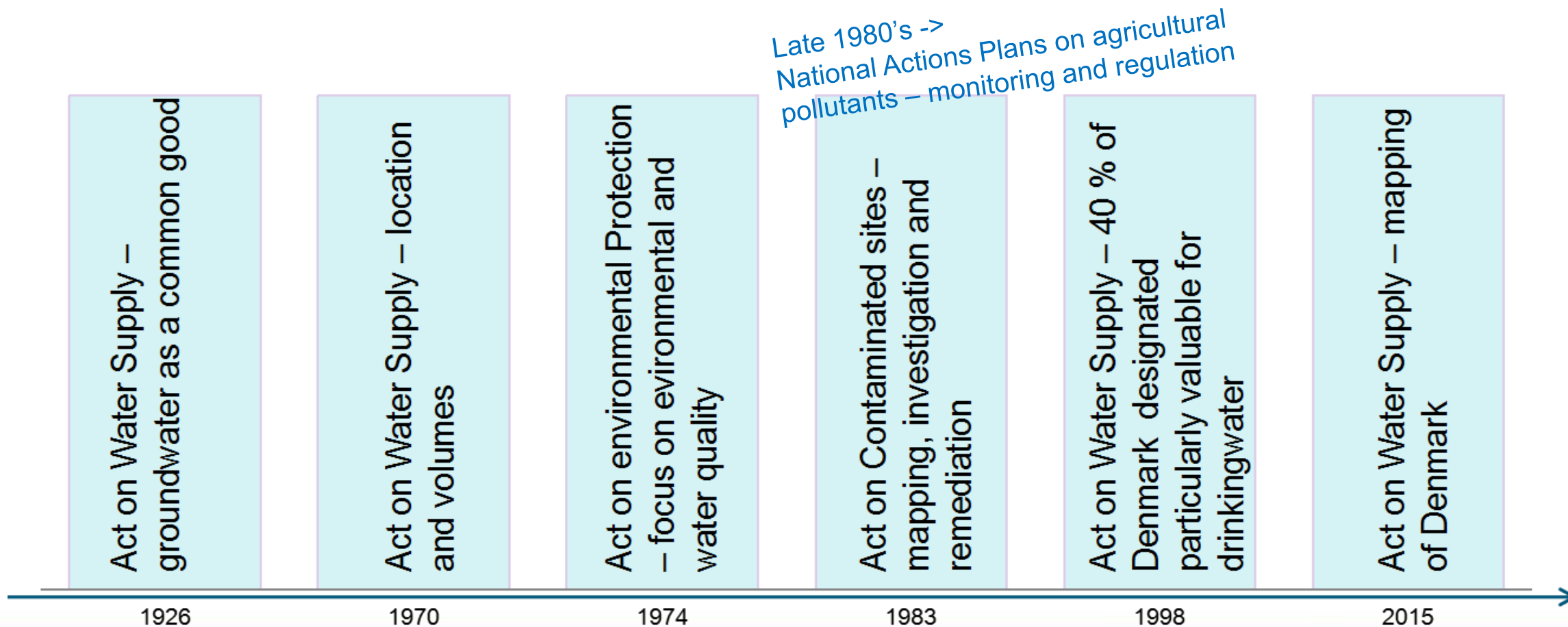


3 经验总结 Experience learnt



■ 以法律建设为抓手，夯实水资源管理基石

Legislation-- consolidating the water resource management



3 经验总结 Experience learnt

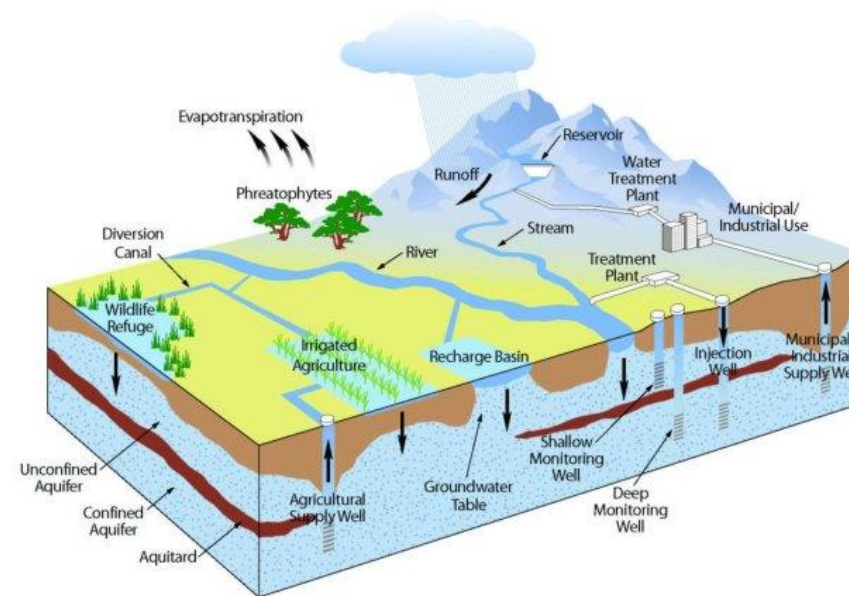


■ 以模型技术为支撑，有力服务水资源综合管理

Modeling techniques – supporting integrated water resource management

Denmark has unique technology on models

- Regional climate model -- with a resolution of 12 km
- National hydrological model called DK-model--with a resolution of 0.5 km

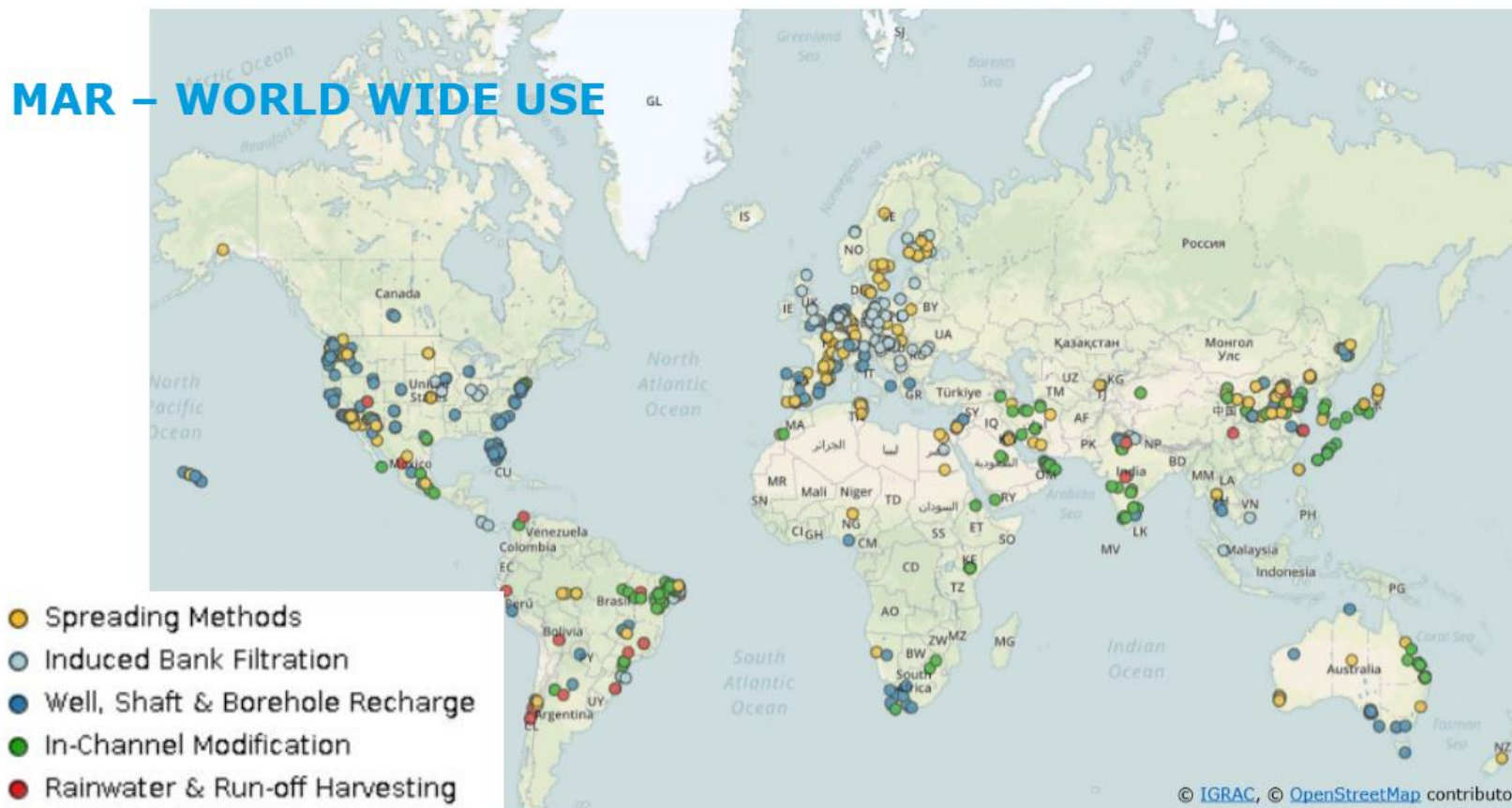


3 经验总结 Experience learnt



■ 以地下水回灌技术为引领，全方位保护地下水资源

Groundwater recharge techniques --protecting of groundwater resources

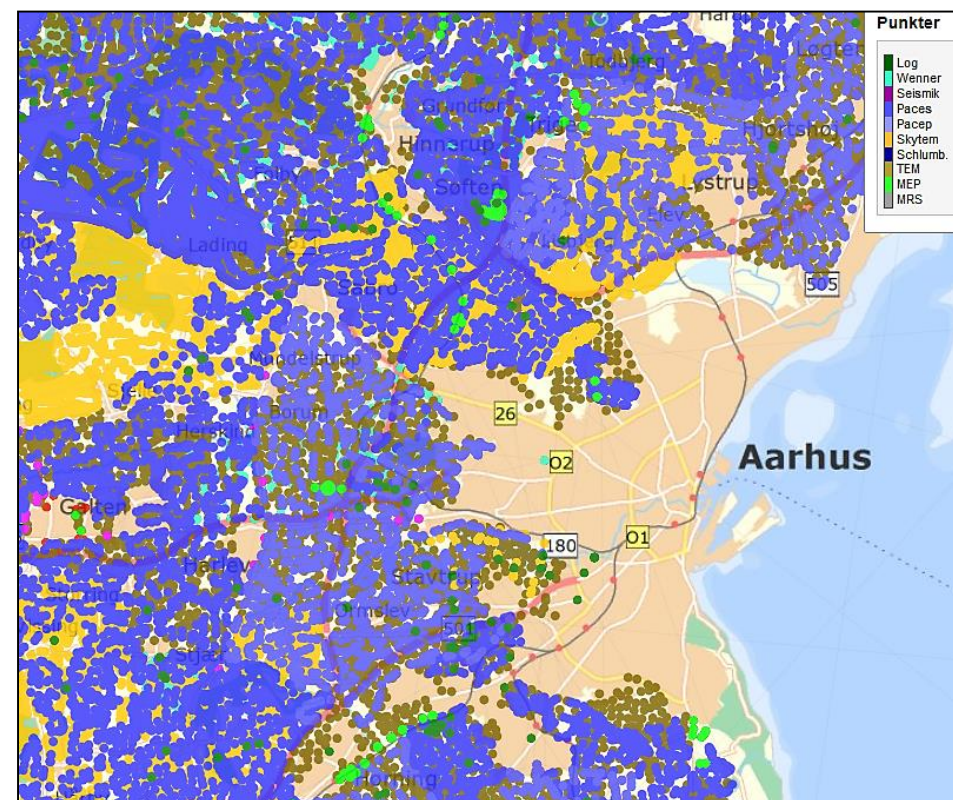
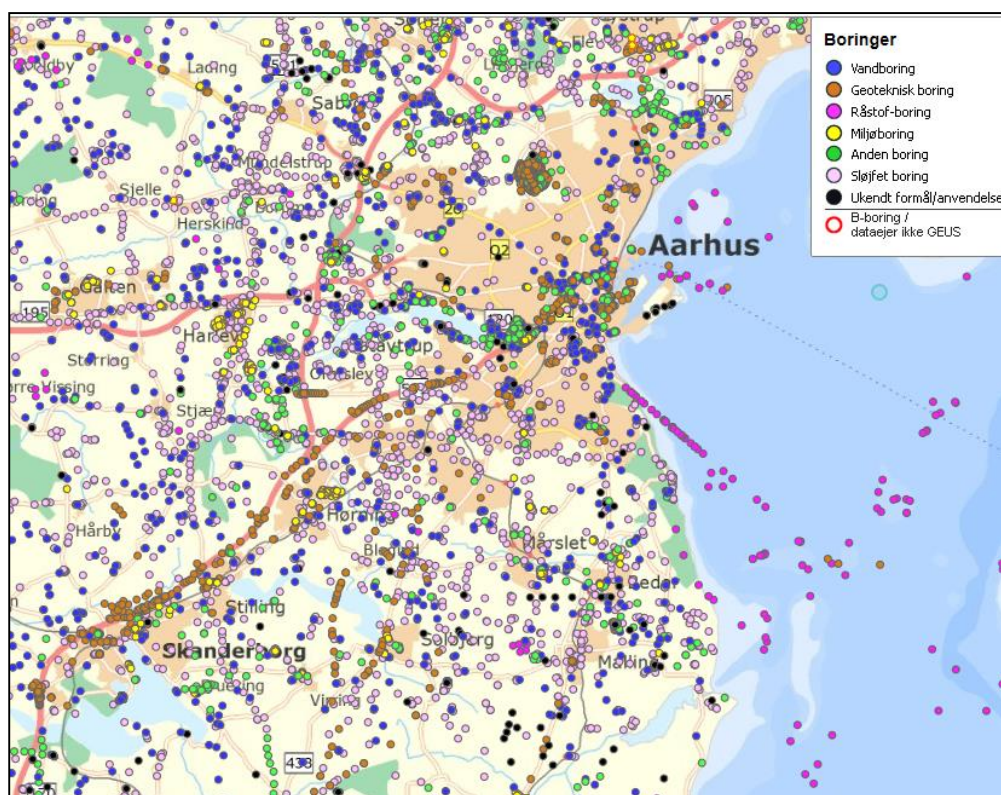


3 经验总结 Experience learnt



■ 以开放共享为原则，助力形成专业评估市场

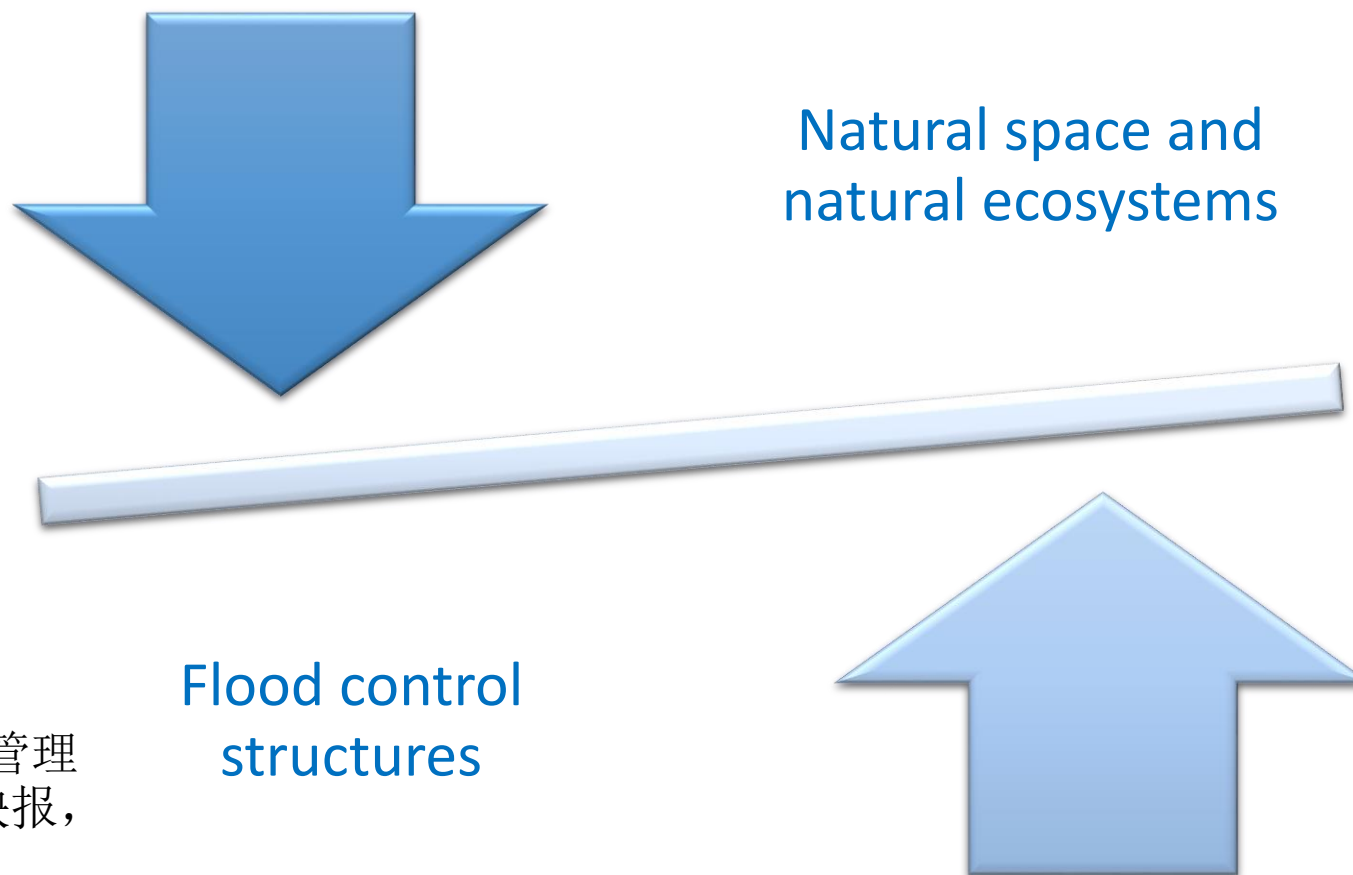
Opennning and sharing idea-form a professional evaluation market



3 经验总结 Experience learnt



- 以生态工法为设计主线，努力打造水生态文明
Ecological engineering— pursuing water ecological civilization



张诚等，丹麦水资源综合管理经验及启示[J]. 水利水电快报，2019.40（5）12-16.

A wide-angle photograph of a cityscape under a blue sky with scattered clouds. In the foreground, there is a green park area with many trees. To the left, a multi-lane highway runs diagonally. In the background, several modern buildings are visible, including a prominent tall, dark skyscraper. The text '谢谢 TAK!' is overlaid in large red characters across the center of the image.

谢谢 TAK!

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